The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

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W. D. CALLENDER, President GEO. P. MILLER, Treasurer
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SUBSCRIPTION—Two dollars a year to United States and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

TO SUBSCRIBERS—Date on wrappers indicates issues with which your subscription expires. In writing to have address changed, give old as well as new address.

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A Reference Work for the Non-Metallic Mineral Industries

UPON his own or some one else's review and estimate of conditions and progress of the year past, every operator bases his plans for the year ahead.

That is why ROCK PRODUCTS spares no effort in helping the producer to obtain and interpret the facts most helpful in arriving at decisions. In the Annual Review and Directory Number each of the industries is reviewed, conditions of the past year noted, progress reported, the trends outlined and, so far as possible, future development is predicted. This is done by experts' knowledge of facts, figures, and tendencies in each industry and is much greater than that of the average individual producer.

The reviews include articles on the cement, lime, gravel, quarry, gypsum, phosphate, slate, talc, slag, silica sand, and sand-lime brick industries, and a review of transportation conditions.

::

MORE SPECIFICALLY HELPFUL, because of their practical information, will be half a dozen accounts of the development of labor-saving machinery. These special articles tell, for example, where draglines can be used to advantage, and what size of line to install; what type of shovel suits each job best, and what are the relative advantages of steam, gasoline, and electric shovels; how to get the best results in blasting, the kind of powder to use, and so on; and similar helpful facts on conveyors, conveying equipment, and other equipment in common use at non-metallic mineral plants.

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A REMARKABLE PLANT—the world's largest combination flux and commercial crushing plant—is just completed. Its features of design and operation every quarry operator will want to note. A complete account of this plant, with many detailed illustrations, makes an important contribution to the Annual Review and Directory Number—the December 30 issue of ROCK PRODUCTS.

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The difficulties are more than cut in two by saving and using the Annual Review and Directory Number. The Buyer's Directory in this issue is as complete as such a directory can be made. Every known reputable maker of equipment for the industry has been included in this index, which is classified so that makers of any equipment can be readily found. Twenty pages of this index make it but the work of a minute to get the names of all manufacturers of what you're looking for.

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LAST, BUT FAR FROM LEAST, are the advertising pages. Between 75 and 100 of these pages, every one with a message of value, deserve—and will receive—the attention of readers who have learned that the editorial pages are not the only ones which impart valuable information. Here indeed are helpful facts and figures, and a wealth of information on the latest and best equipment available.

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KOEHRING
Crane-Excavator

1. In restricted quarters, no need to travel the crane back and forth. Just boom loaded bucket. This is a regular operating action with the Koehring and puts no strain or abnormal wear on any part.

2. *No* interlocking sets of gears — no clutches with double functions.

3. All operating functions independent —hoisting, peaking, sluing, rotating and propelling may be operated independently or in any desired combinations.

4. Two line speeds. No change of gears or drums to change from drag line to grab bucket—just change buckets and shift a clutch.

5. Quick change to power shovel, by change of boom, addition of dipper handle, and shovel, cable and drive parts.

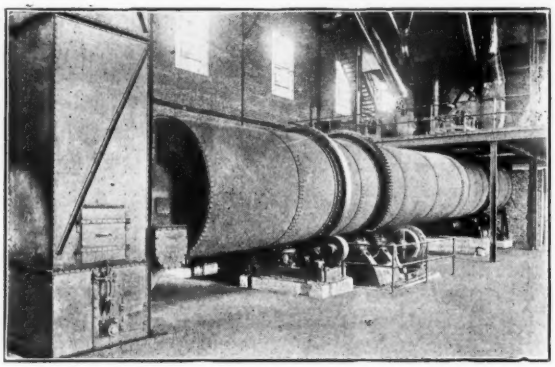
No. 2 Capacity: 12 tons at 12′ radius. ½ yard clamshell bucket loaded with sand or gravel at 45′ radius. ¾ yard clamshell bucket loaded with sand or gravel at 39′ radius. 1 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard clamshell bucket loaded with sand or gravel at 24′ radius. 1 yard Page drag bucket on a 40′ boom.

No. 3 Capacity: 20 tons at 12′ radius. 1 yard clamshell bucket loaded with sand or gravel at 50′ radius. 1½ clamshell bucket loaded with sand or gravel at 39′ radius. 2 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard Page drag bucket at 40′ radius.

KOEHRING COMPANY
MILWAUKEE WISCONSIN

Write for
Koehring Crane Bulletin No. 3

KOEHRING HEAVY DUTY



To Users of Rotary Dryers

With over twenty-eight years' experience in the manufacture of dryers;

With eight distinct types to draw from;

With the energies of competent engineers devoted exclusively to the handling of drying problems;

The Ruggles-Coles Engineering Company is in position to offer users of direct heat, indirect heat and steam dryers, the dryer to fit their particular requirement and follow it up with a service that has required years to perfect.

Ruggles-Coles Engineering Co.

120 Broadway - - New York, N. Y.

Works: - - - - - York, Penna.

RUGGLES-COLES DRYERS

THE LAST DAY

FORMS CLOSE FOR THE REVIEW & DIRECTORY NUMBER

OF

Rock Products

DECEMBER 23rd

This is simply a reminder to the Manufacturer who has delayed sending in his Advertising for insertion in this unusual and valuable issue-

START YOUR SUBSCRIPTION WITH THIS NUMBER!

WIRE ROPE

Do You Still Accept This Uncertain Evidence?

Or will you insist upon "WILLIAMSPORT" with the positive protection their "Telfax" patented Tape Marker assures

SINCE the introduction of the patented Telfax Tape in Wire Rope [which distinguishes each grade from the other], "Williamsport" has become the *preferred* Rope on thousands of operations where protection against accidents is the paramount thought among executives.

The use of Williamsport Telfax marked wire rope indicates that operators are endeavoring to raise their standard of safety in the use of wire rope, because of the positive, unmistakable assurance of its grade.

Why take a chance with any wire rope which does not give you this direct factory protection?

FREE BOOK

Send For It!

Write Us for Our Prices Today

WILLIAMSPORT WIRE ROPE CO.

Main Office and Factory
WILLIAMSPORT, PENNA.

General Sales Office
Peoples Gas Building, CHICAGO

"The Fastest Growing Wire Rope Plant in America"

Help the Help

You wouldn't require your manager, your superintendent, your purchasing agent, your sales manager to use the same desk, waiting their turn for the common property until the other fellow finishes. Nor is it economy to require half a dozen or more executives to share among them one or two copies of ROCK PRODUCTS, one of the most helpful operating aids you can furnish them. Each issue of ROCK PRODUCTS gives matter of special as well as general importance. For example, the

MANAGER — needs the news while it's news, to keep in line with production and marketing trends.

SUPERINTENDENT—and all operating men should see the plant articles, Hints and Helps, Questions and Answers, for time —and money-saving kinks.

PURCHASING AGENT—wants the New Machinery and advertising pages for the latest equipment available.

SALES MANAGER — must have the latest price quotations at the earliest possible moment. ALL need the magazine, for the technical articles, and the help every issue contains.

A magazine a week old has lost some of its value to the reader. Give every responsible head his personal copy, and see how many new suggestions, how many cost-cutting ideas, how much more intelligent service from these men result.

THE TIME TO START these individual copies is right now, when the Annual Review and Directory Number—issued December 30—will be included FREE. Read the announcement on page 2 of this remarkable issue coming in two weeks.

Then fill out the coupon at right for every man in your plant who deserves a personal copy.

Rock Products, Chicago.

Gentlemen: Send personal copies of ROCK PRODUCTS for the next year to:

Name.....
Address.....

Name.....
Address.....

Name.....
Address.....

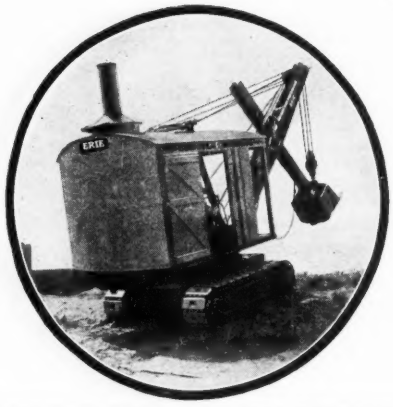
Name.....
Address.....

Name.....
Address.....

Name.....
Address.....

(1) Check enclosed at $2 for each or $3 for 2 years).
(2) Bill me January 1.

Signed.....
Address.....



Not "How Much Should It Cost?" but— "How much DOES it cost?"

The buyer of excavating machinery is entitled to know the actual cost of steam shovel upkeep—***not merely five or six unusual records,*** but the averages of many shovels on a wide variety of work.

Upkeep costs are important to the steam shovel owner because of the direct repair expense that is involved — but far more important is the costly loss of time while repairs are being made.

A low repair-cost record spells ***steady operation,*** which is the finest feature of any good piece of construction machinery — the ability to work along week after week, and month after month, without tying up the job.

IN order to provide contractors with this essential information, ***the actual data on upkeep cost and steady service,*** we are offering prizes for the best records made by ¾ cu. yd. shovels which have received good care. We are going to award 20 prizes ranging from a first prize of $100.00 and a good gold watch, down to $5.00, in addition to $5.00 for each record that is published. (See list of prizes, at left.)

In order to avoid comparisons which might reflect unfavorably upon other makes of steam shovels, it has been decided to limit the entries to ERIE Shovels only

PRIZES:

FIRST PRIZE, $100.00 and a solid gold watch, 17 jewel Waltham movement, case engraved with winner's name and standing in contest.

SECOND PRIZE, $50.00 and a solid gold watch, 17 jewel Waltham movement, case engraved with winner's name.

THIRD PRIZE, $25.00 and a solid gold watch, 17 jewel Waltham movement, case engraved with winner's name.

FOURTH PRIZE	$20.00
FIFTH PRIZE	$15.00
SIXTH PRIZE	$10.00
SEVENTH PRIZE	$10.00
EIGHTH PRIZE	$10.00
NINTH PRIZE	$10.00
TENTH PRIZE	$10.00
ELEVENTH to 20th PRIZES, inclusive, each	$5.00

In addition to the above awards, $5.00 will be paid for each record that is published.

JUDGES:

The letters will be rated, and the prizes awarded, by the following board of judges:

Arthur S. Bent, of Bent Brothers, Los Angeles, Calif., pioneer contractors on large hydro-electric and irrigation project construction; President of the Associated General Contractors of America.

Halbert P. Gillette, Editor of "Engineering and Contracting" magazine, and author of "Handbook of Cost Data," "Earth Work and Its Costs" and many other engineering works.

Arthur C. Vicary, Vice President of the ERIE Steam Shovel Co.; mechanical engineer, with many years of specialized experience on steam shovel work.

In making the awards, the judges will consider the actual record made by the shovel, and also interesting and informative details that are given in addition to the actual record. If two machines were to make exactly the same record, the more interesting and informative letter would be given the higher rating; photographs also would be considered.

How to Enter the Contest

Records may be sent in by steam shovel owners, by managers, or any employee who is in direct contact with the shovel work—the superintendent, engineer, foreman or steam shovel operator. But in every case there must be a written statement by the owner of the machine, to the effect that the figures submitted are correct to the best of his knowledge.

Not more than one letter can be entered from one concern. If two or more entries covering different machines are received from one company, the best letter sent in will be considered. Contest closes December 31, 1922.

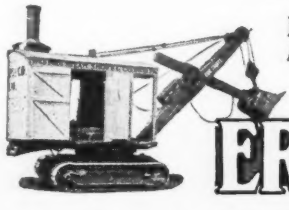
Information to be given in letter:

(1) Approximate number of days worked by shovel since put into service.
(2) Approximate number of cubic yards of material handled—stating how much classified as earth, how much rock, how much shale, etc.
(3) Total amount spent for repair parts. (Do not include dipper teeth, hoisting cable, or grate bars, as these are wearing parts which need replacement on any shovel that is working, even when it receives the best possible care.)
(4) Total lost time, during which the work was delayed for repairs to shovel.

Besides the above information, any additional details of interest should be included, together with one or more photographs of the shovel in action, if available.

Address your letter to A. C. Vicary, ***Vice-President,*** ERIE Steam Shovel Co., Erie, Pa.

If your firm does not own an ERIE and you cannot enter this contest, please refer this advertisement to someone who can act upon it. Thank you!



ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.
Incorporated 1883. Formerly BALL ENGINE CO.
Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Chicago. Representatives throughout the U. S. A.

TRAYLOR

of Allentown, Pa.

as the old year passes, ventures the hope that the readers of

Rock Products

may enjoy

The Merriest of Yuletides

and experience

Prosperity and Happiness

in

Bountiful Measure

during

1923

and sees in the new year, opportunity to continue and improve that service which it has been a pleasure and a privilege to render in the past.

President

PLYMOUTH
Gasoline Locomotives

Bought One Chain Link in Three Years

Over in Berne, Indiana, a 3-ton Plymouth Gasoline Locomotive has given daily service for three years with only one chain link as repairs.

During this three years this Locomotive hauled 500 tons of rock daily from shovel to hoist, using only 2½ gallons of gasoline per day.

Meshburger Brothers, owners, write:

"Your Locomotive is the cheapest machine to operate we have in our plant. It is doing fine in every way, and never causes trouble."

The Plymouth is both pioneer and paramount. No other gasoline Locomotive approaches it in any essential. Ask us for literature.

THE FATE-ROOT-HEATH CO., PLYMOUTH, OHIO

Plymouth Locomotive in Plant of Meshburger Bros., Berne, Ind.

Rock Products

Volume XXV | Chicago, December 16, 1922 | Number 25

Digging Sand With an All-Steel Dredge

The dredge "W. R. Halliday" has been in service several months and has maintained an average of 50 cars of sand per day

THE H. H. Halliday Sand Co., at Cairo, Ill., has recently put into service on the Ohio river a dredge-boat that is believed by many operators and other authorities to be the most modern sand and gravel suction type dredge in use in this country.

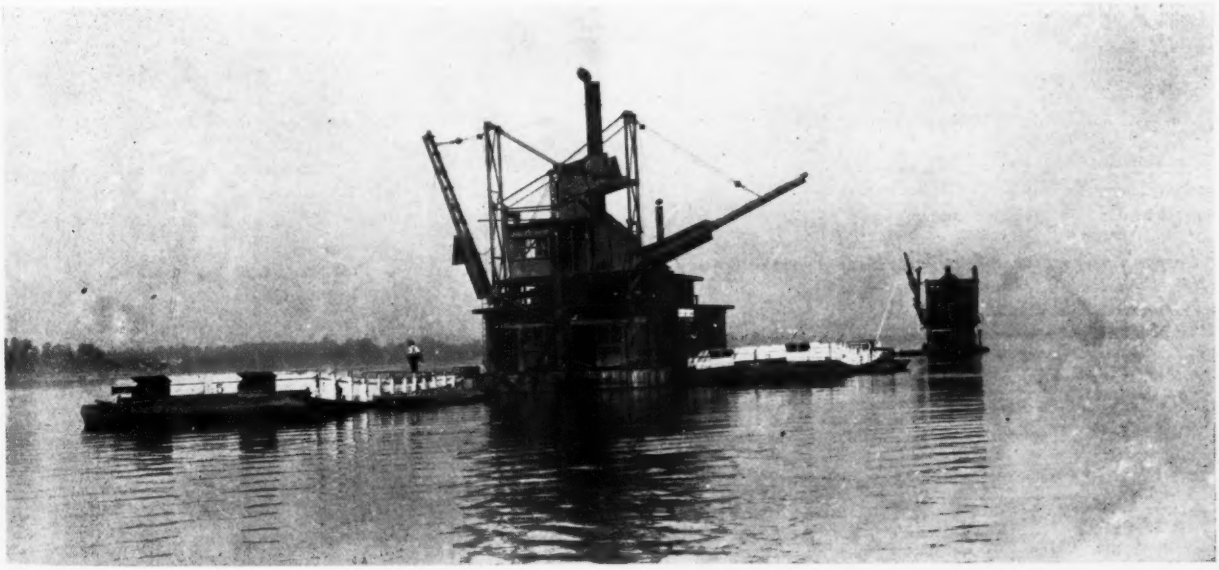
The dredge has an average capacity of 60 cars of sand per 10-hr. day, although it has loaded a 15-car barge in 2 hr. 15 min., or 6⅔ cars per hour.

"Because of unusual river conditions here ever since the completion of this dredge, we have not had an opportunity of testing it out on our gravel bar. Of course when we put the boat on a bar where we are saving both sand and gravel, we expect to increase its capacity about 50 per cent," says N. R. Halliday, who is in charge of the production.

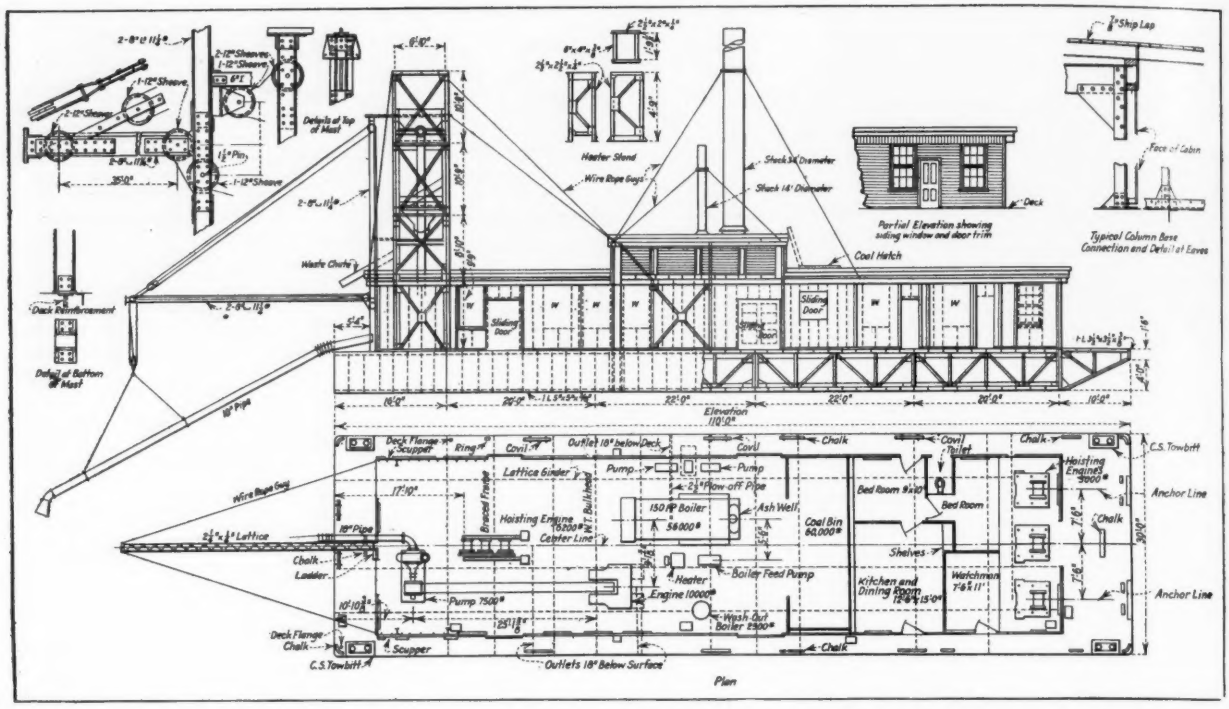
This dredge was built by the American Bridge Co. at Ambridge, Pa., and is of steel construction throughout with the exception of the cabin, which has an outside covering of wood. The over-all dimensions of the boat are 110x30x5½ ft., with a freeboard of 30 in. The bottom and sides of the hull are of 5/16-in. plate and the deck is of ⅜-in. plate. The hull is divided into six water-tight compartments, which is a feature worthy of the consideration of those intending to build a dredge.

Tests have shown that after filling any two of the compartments with water the boat will still float. Thus, if the boat should develop a leak, or two leaks, the operation would not be halted and the compartment in which the leak existed could be pumped out and repaired with no loss of production. Deck openings have been provided in each compartment for siphoning purposes, should the necessity arise for pumping them out. A large manhole is also provided in the after-end for the accommodation of extra lengths of suction pipe. This eliminates storage on deck, the method usually employed.

The entire dredge is operated by steam, furnished by one 150-hp. Economic return tubular boiler of special design, built by the Erie City Iron Works, Erie, Pa. The



The "W. R. Halliday." Sand is loaded on a barge on one side and gravel on the other. The 40-ft. smokestack affords a natural draft which keeps the coal costs low



General plan and elevation of the dredge. The machinery is so distributed as to obtain a perfect balance of the boat

boiler is fitted with a 40-ft. stack which affords a natural draft. The stack is hinged so that it can be lowered when the boat is passing under a bridge.

In addition to this boiler, a small Erie upright boiler is also installed for washing out the main boiler and to heat water for general utility purposes.

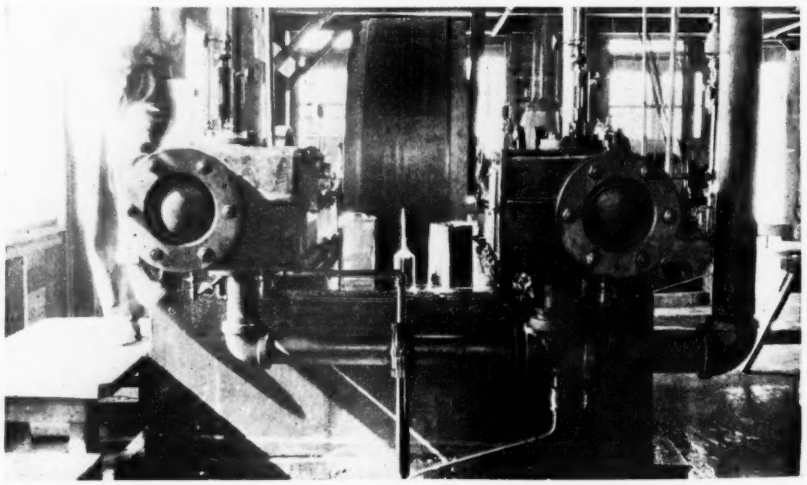
Before being fed into the boiler the water is heated to within 5 deg. of exhaust steam temperature. This is accomplished by the use of a 150-hp. Worthington (Stilwell type) open feed heater equipped with an oil separator and a charcoal filtering compartment. The heater gets its steam from the main engine exhaust, but is equipped with a blower so that hot water can be fed to the boiler when the main engine is not running.

Water is pumped into the heater by a 4½x2¾x4-in. Worthington horizontal duplex piston pattern pump equipped with pump governor, thus automatically maintaining proper water level in the heater. From the heater it is fed to the boiler by a 5¼x3½x5-in. pump of the same make and type. A third pump of this type is used for pumping water over the suction pump shaft and for general purposes.

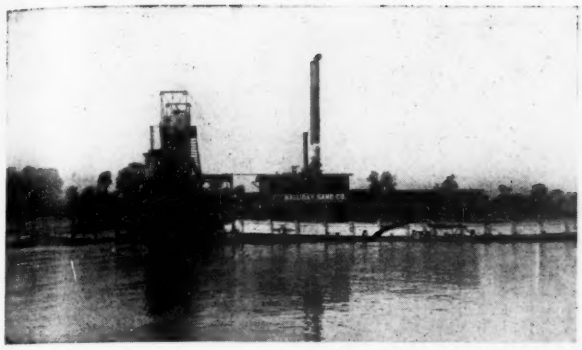
The main engine is a Houston, Stanwood & Gamble 10x14 in., Class C twin, side crank, throttling governor with balanced valve. The engine, although rated at 100 hp., develops 150 hp. under 150-lb. steam pressure and maintains a consistent speed at all times. This engine is connected to the suction pump by a 14-in. endless leather belt which is kept at the proper tension by an iron frame vertical belt tightener. The pump—a 10-in. "Amsco," left hand, top discharge—is equipped with a 30-in. diameter, 20-in. face pulley. Owing to the consistency in the speed of the engine, and to the fact that the pump and engine are belt connected, the pump also maintains a consistent speed—a requisite of any successful pumping operation.

One engine handles the raising and lowering of the loading chutes and suction pipe. This engine is a double cylinder, 6¼x8-in. Lidgerwood Special No. 207, and is equipped with four friction drums. The engine is controlled by levers in quadrant stand in the operator's house above the roof on the after-end.

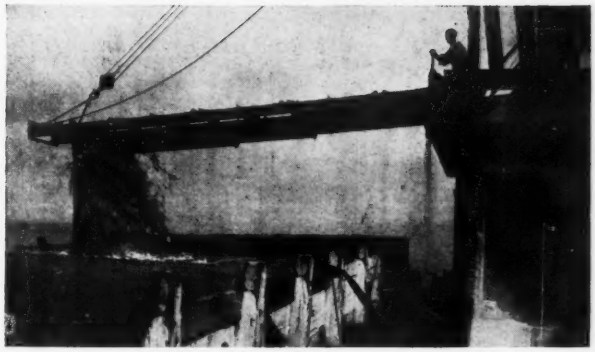
Barges while being loaded are moved by cables controlled by an 8¼x8-in. Lidgerwood double cylinder hoist. These cables extend to the forward and after-end of the dredge, passing through sheaves and thence on to the barges. The barges, whether loaded or empty, can be moved in either direction as desired at a maximum of speed and without stopping the loading operation.



This engine is connected to a 10-in. suction pump by a 14-in. endless leather belt



A side view of the dredge. Note the elevation of the screening equipment



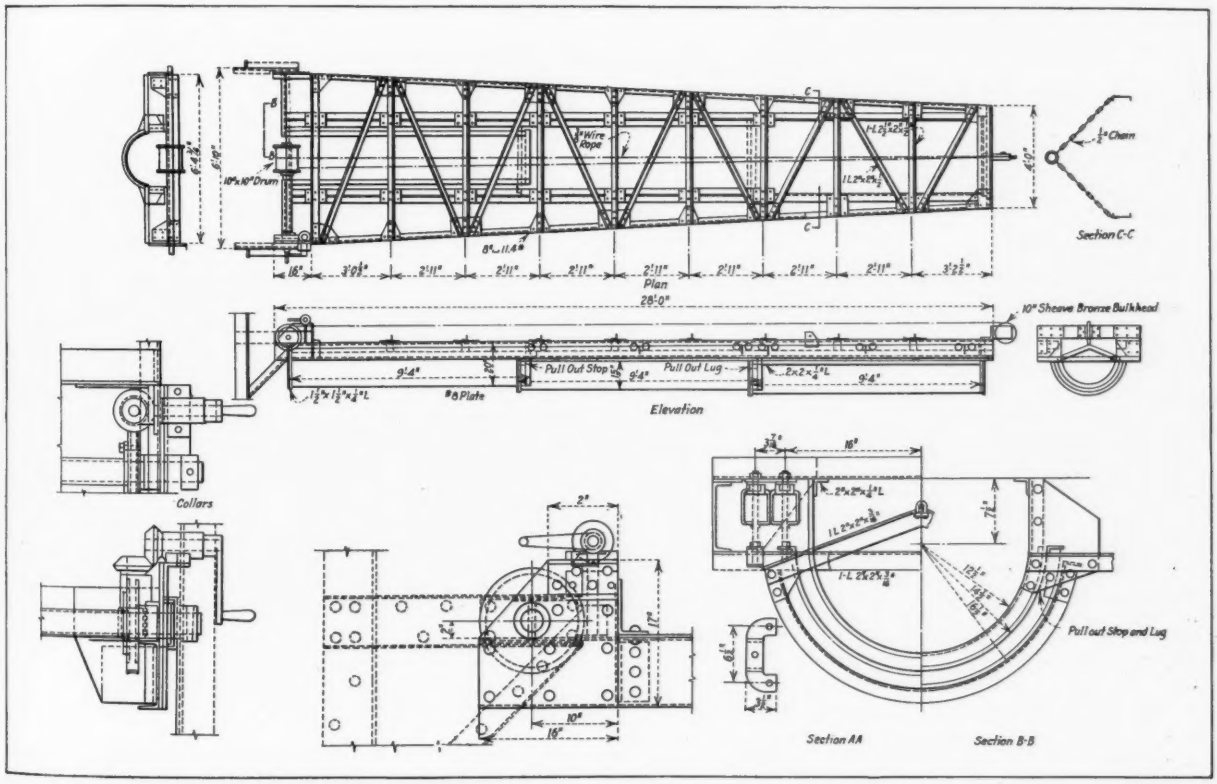
Material may be loaded on either side of a barge or in the middle with this telescoping chute

Two 1200-lb. Baldt-Stockless ship anchors are controlled from each forward corner by individual engines. The anchors are spread at a maximum distance so that by giving slack to either of them, the dredge can be moved about in a radius of several hundred feet without moving the anchors. The engines controlling the anchors are Lidgerwood 8¼x8 in., double cylinder, single drum and are of the reversing ship's winch type. They are equipped with a special two-piece hand brake operated by a hand wheel. These engines are sensitive and respond to the slightest application of power.

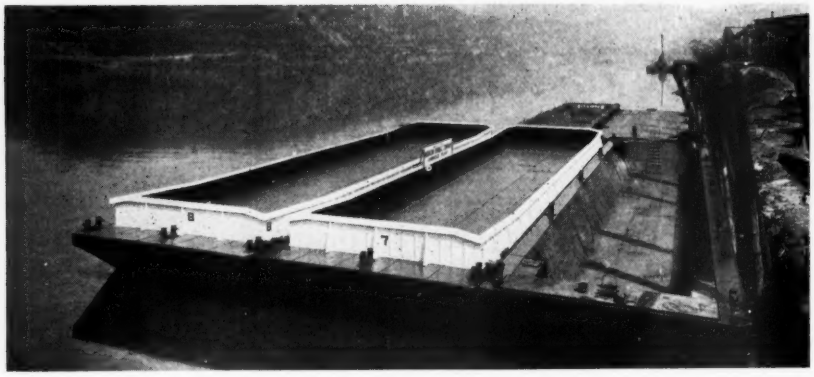
In addition to the anchors, spuds are provided on either side of the boat. These spuds are 10 in. square and 40 ft. long, and when lowered keep the boat from swinging sideways, thus eliminating the chances of injury to the suction.

The suction pump discharges into a box 6x7x4 ft. deep, which empties on an oversize gravity screen. This screen is 6 ft. wide, 12 ft. long and has 2x3-in. staggered openings. All oversize is chuted by gravity back into the river. That material passing through the perforations is dropped to a sand screen having 3/16x1¼-in. openings. The rejections from this screen are chuted direct into a barge on one side of the dredge and the material that passes through the 3/16-in. openings is chuted into a sand box under the screens and thence through a telescoping chute into a barge on the other side. This equipment is of steel construction throughout.

The telescoping chutes on either side of the dredge are hung on steel tracks which are mounted on a steel boom. The entire chute, or boom, is raised and lowered by a hoisting engine. The telescoping feature is effected by a hand-powered, worm-geared winch mounted on the lower or deck end of the boom. The winch controls the sections of the chute by the use of a ¼-in. cable. In this way the chute can be extended to the opposite side of the



This drawing shows the details of the telescoping chutes. Standard size gears, worms, and worm wheels are used in the assembly so that repair parts may be easily obtained



As the two 15-car capacity barges appeared before being placed in service

barge, to the center or may be made to discharge on the side of the barge next to the dredge. The operation of the winch is easily accomplished, due to the worm-gear assemble and can be manipulated with one hand.

The cabin framework is of steel construction and, due to its ruggedness serves as a truss, which partly accounts for the noticeable absence of vibration on the boat. The cabin comprises sleeping quarters, dining-room, kitchen and store-room. The rooms are supplied with running water and steam heat.

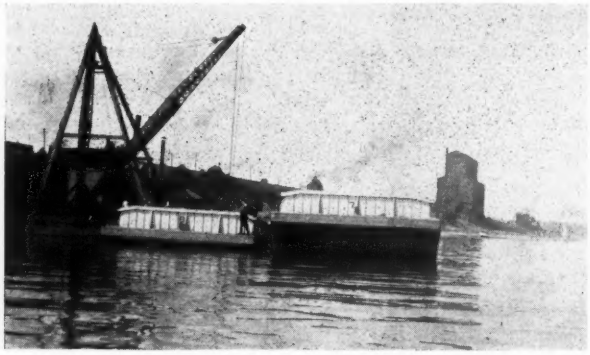
Mr. Halliday is to be given credit for the general layout and design of the dredge and the selection of all the machinery. Under his direction E. B. Fay, consulting engineer, 700 Fullerton building, St. Louis, drew up and completed the final plans.

At the same time the company had the dredge built it also purchased two large all-steel barges. These barges are 30x130 x7½ ft. with a freeboard of 6 in. Their capacity is 800 tons, or 15 cars each. In addition to these barges the company also has in service four wooden barges of six cars' capacity each.

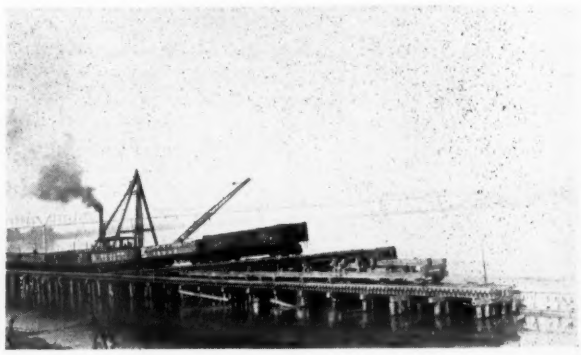
Barges are towed from the dredge to the loading unit by tug. The loading unit is a large derrick boat equipped with 1⅝-yd. clamshell bucket and loads direct into railroad cars from the barges. At this point the company has constructed a trestle which parallels the river at its edge, so as to have the cars within reach of the derrick. The trestle is furnished with a cradle-typed movable incline. This enables the company to operate at practically any river stage.

The company is keeping in reserve for emergency use its former digging unit, the "Virginia." This boat is steam-powered and is of the direct-connected suction type equipped with rotary screening equipment and has a capacity of 30 cars per day. It is kept in good repair and is ready to operate at all times.

This company is composed of but two men—H. H. and N. R. Halliday. The former is in charge of sales and the office, while the last named is responsible for the production.



Two all-steel barges being unloaded by the derrick boat "Herbert"



With this cradle-type trestle the derrick boat can load direct into cars at practically any stage of the river

Competition Hurts French Cement Industry

BELGIAN and German competition has almost completely arrested the exportation of cement from France in the last three months. French manufacturers now shipping only small quantities, which they are content to sell at cost, reports Vice-Consul Corcoran in *Commerce Reports*.

The factories at Boulogne-sur-Mer, the largest cement manufacturing center of France, are capable of producing 600,000 tons annually, or about three-fifths of the total French production. Conditions in this region therefore affect the entire industry.

This digging unit is ready for service in an emergency

Big Possibilities for the Use of Dolomitic Limestone*

By J. B. Shaw and G. A. Bole[1]

Part I—New Developments in Oxychloride Stucco and Flooring

ABSTRACT

Substitution of Calcium for Magnesium Chloride.—Calcium chloride can be substituted for magnesium chloride only under special conditions. Calcium chloride solutions must be much more dilute than magnesium chloride. Less filler can be used with magnesium chloride. Mixtures of the two chlorides do not give as good cement as either separately.

Dolomite-Calcium Chloride Cements.—Tensile strength, volume change, weathering tests, specific gravity figures are given. Some good cements are found. Some of the cements have weathered for two years.

Dolomite-Magnesium Chloride Cements.—Tensile strength, volume change, weathering tests, specific gravity figures are given. Some excellent cements are reported equal to magnesite cements with equal MgO content.

MAGNESIUM oxychloride cement has been used to some extent since the middle of the last century, but in view of some of its remarkable qualities it is difficult to understand why it has not found a very much more extensive use than it has. Some of the excellent qualities which have been attributed to it are as follows:

Very high tensile strength.

Low specific gravity, making a cement of great strength with little weight.

It is capable of taking a high polish.

When mixed with appropriate filler, it has a very high resilience, making it comfortable for office floors, etc.

It is not slippery.

It can be applied in a thin coat over wood or cement without cracking.

A search for the cause of the restricted use of this material revealed two serious disadvantages, namely:

(a) High cost.

(b) Frequent failure of floors laid with the cement, by cracking, buckling and expansion.

Cost of Magnesium Oxychloride Cement

The high cost of this cement is partly due to the fact that magnesite, from which it has been made, occurs only in restricted areas far removed from the centers of consumption. The fact that the material has failed frequently, rendering it necessary to do the work a second time, compelled those selling it to demand a high margin of profit to ensure them against loss. These two factors have combined to keep the cost of this material so high as to restrict its use.

The prestige of this cement was greatly damaged during the latter part of the last century by certain unscrupulous manufacturers who, without making sufficient preliminary experiments to learn how properly to make it or whether it would survive under exposure to weather, used it for building blocks and built houses of them. The material crumbled away in a few years and magnesium oxychloride cement has since labored under the disadvantage of this reputation.

THIS is a preliminary discussion of a subject of vast importance and significance to the quarry industry. Dolomite is a little understood mineral. Partially calcined—the CO_2 driven out of the magnesium carbonate ($MgCO_3$) but retained in the calcium carbonate ($CaCO_3$)—a cement of remarkable properties may be produced. Another article by the same authors will show how this may be accomplished.—Editor.

This paper contains some of the results of an effort to find a method of utilizing the excellent qualities of this cement by overcoming the disadvantage under which it is laboring.

Reducing the Cost

Source of MgO.—As stated, magnesites have been the only source of caustic magnesia for the cement. This is, and must of necessity remain, an expensive material.

Dolomitic limestones are very widely distributed, occurring in large quantities close to the centers of industry. The only difference, chemically, between most magnesites and dolomites is the ratio in which the constituents occur. They contain practically the same ingredients. Therefore because of its large production and easy accessibility to the centers of consumption, substitution of dolomite for magnesite would result in very material reduction of first cost of the material.

Chloride.—Calcium chloride, being a by-product from chemical processes, and not having found a very extensive use, can be obtained at very much lower cost than magnesium chloride. This substitution would result in a further reduction in cost of the finished product. Barium chloride may be used.

While it seems likely that these two substitutions would reduce the cost of the material to a point where it could be widely used, such reduction would be useless unless the quality of the material could be so controlled as to give a uniformly safe product. The results of preliminary experiments along these lines were encouraging.

The oxide of magnesia exists in two forms, the light caustic oxide (sp. gr. 3.0) and the dead burned oxide (sp. gr. 3.8). The caustic oxide is obtained by calcining compounds containing magnesium carbonate at low temperature. The dead burned oxide is obtained by heating at high temperature, or for a long period at medium temperature. The caustic oxide will hydrate slowly with very little evolution of heat. The dead burned oxide will not hydrate. The caustic oxide is the form used in making oxychloride cement; dead burned is for refractories.

*Part I of this article was published in the Journal of the American Ceramic Society, Volume 5, No. 6, in June, 1922, under the title, "New Developments in Oxychloride Stucco and Flooring." Part II, reprinted from the November Journal of the society, is entitled "Caustic Calcination of Dolomite and Its Use in Sorrel Cements."

[1]Title covering this work was given in the program of the American Ceramic Society in February, 1919, much of the work having been done prior to that date, but for various reasons the material was not put into proper shape for publication until this time.

The first question arising in considering the use of dolomite as a source of MgO is that of the influence of the carbonate of lime.

1. Will the presence of calcium oxide, resulting from calcining at too high a temperature, be injurious to oxychloride cement?

2. Is it possible commercially to calcine the dolomite so as to decompose the $MgCO_3$ to form caustic MgO and leave the $CaCO_3$ undecomposed?

3. Will the amount of MgO in such a limestone be sufficient to give good strong cement when diluted with the unavoidable $CaCO_3$ in the original rock?

Preliminary Experiments

The Dolomite.—In an endeavor to answer these questions a dolomitic limestone of massive form was selected having the following composition before calcining:

$CaCO_3$	55.83
$MgCO_3$	43.37
SiO_2	.14
FeO_3 and Al_2O_3	.14
H_2O organic	.52
	100.00

Magnesite.—California magnesite containing 98 per cent $MgCO_3$ was calcined at 1000 deg. C. and tested to compare with the dolomites.

Calcining.—Fifty pounds of the rock were crushed to half-inch size and calcined in a covered sagger in a small updraft gas kiln. Thermo-couple was placed just over the surface of the dolomite.

Sample *A* was raised to 650 deg. C. in 3 hr. and temperature held between 650 and 700 deg. C. for 3 hr.

Sample *B* was raised to 770 deg. C. in 3 hr. and temperature held between 770 and 800 deg. C. for 3 hr.

Properties of Calcined Material.—Sample *A* was unchanged in appearance; color and hardness being about the same as the original rock.

Sample *B* has changed from the gray of the original rock to practically white. It was still hard but distinctly more brittle than the original rock.

Grinding.—The calcined material was ground dry in a ball mill. *A* ground slowly but left mill and pebbles clean. *B* ground somewhat more rapidly than *A* but coated the sides of the mill and pebbles. It has been noted that some magnesite calcined at 800 to 1000 deg. C. sticks to the sides of mill and pebbles, or, in other words, balls up in the mill.

The screen analysis after grinding was as follows:

	A Pct.	B Pct.
On 100	1	5
Through 100 on 150	20	24
Through 150 on 200	15	15
Through 200	64	56

Chemical Tests.—The chemical tests for determining what carbonates and what oxides were present in the calcined material and in what proportion, were carried out by the method outlined by G. A. Bole[2] for direct determination of CO_2 also using the ammonium chloride method for active lime.

Below are given dissociation temperatures obtained on these materials.

	Deg. C.
Magnesite	470
Calcium carbonate	885
Mixture $MgCO_3$ and $CaCO_3$	470
†Raw Dolomite	470

Temperature at which the pressure of the CO_2 becomes atmospheric all at approximately 730 deg. mm. Hg.

Determination of MgO, CaO, $MgCO_3$ and $CaCO_3$ in Calcined Material.—Total CO_2 was determined by blasting weighed sample. The CO_2 in $MgCO_3$ was determined by heating weighed sample at 700 deg. C. in an atmosphere of CO_2 until evolution of gas ceased and measuring the loss by the above-mentioned method, CO_2 and $CaCO_3$ were found by difference.

Results Obtained

		A (calcined at 650-700) Pct.	B (calcined at 770-800) Pct.
Total CO_2 lost by blasting		36.50	26.50
CO_2 lost by heating at 700° C.		1.67	0.00
Calculated results	$MgCO_3$	4.5	0.0
	$CaCO_3$	70.0	60.0
	CaO	0.0	17.5
	MgO	25.5	22.5

The ammonium chloride method for free lime gave (*A*) 0.50 per cent and (*B*) 18.2 per cent of free lime respectively.

The difference in CaO content indicates that a part of Sample *B* must have reached a sufficiently high temperature to decompose considerable quantity of $CaCo_3$. The effect of this free lime on the results in the physical tests is very evident.

Heat Evolved During Hydration.—This was determined by mixing 50 gr. of calcined powder with 25 cc. of water and inserting a thermometer in the mass. The method is admittedly crude and only indicates comparative values.

A calcined 650-700° } no rise in temperature

B calcined 700-800° } 11° rise in temperature

Magnesite—Calcined 1000° C. } no rise in temperature

Presence of CaO in B is clearly indicated by the rise in temperature.

Oxychloride Cements.—The calcium chloride used in making up the solutions showed the following analysis:

$CaCl_2$	95.00
$NaCl_2$	1.44
H_2O and organic matter	3.40

The solutions were made up to 20 and 25 deg. Baume and kept in stoppered bottles. Standard Ottawa sand was used.

The sawdust was fine (80-mesh) and dry.

The rule adopted for making up the cements was to follow industrial practice, by adding enough solution to make all the cements up to the same consistency as far as possible. Each mix was made up to such a consistency that it would just stand without flowing. The results obtained showed this to be a mistake as the amount of solution varied greatly, making large differences in the ratio of oxide to chloride and hence detracting from the value of the data obtained because of difficulty in interpretation. Later experiments show the results obtained by varying the ratio between MgO and chloride.

Time of Setting.—Cements made with calcium chloride are slower setting than those made with magnesium chloride.

Much free calcium oxide seems fatal to the cements. Sample *B* showed no setting in 24 hours and even after two weeks was soft. When magnesium chloride was added to this sample, efflorescence was distinctly evident in ten hours. The white scum then started continued to collect for weeks. Qualitative tests showed these crystals deposited on the surface to be calcium chloride. The reaction producing this result is probably as follows:

$$CaO + MgCl_2 + H_2O = Mg(OH_4) + CaCl_2$$

No efflorescence was noticed at any time on Sample *A* or the calcined magnesite, whether made up from magnesium chloride or calcium chloride.

Constancy in Volume.—Constancy in volume was roughly determined by laying pats of the cement on glass plates, noting cracking and measuring linear shrinkage of test bars.

A—Every cement made from this sample adheres firmly to glass plates. No cracking was noted in any trials and no measurable shrinkage.

B—Decided shrinkage. No adherence to glass plate. Not hard.

Magnesite.—All trials made up from heat magnesite show some shrinkage. An important point noted is that the neat magnesite trials made up with calcium chloride show less shrinkage than those made up with magnesium chloride.

Neat MgO with $MgCl_2$ sets very rapidly and attains great hardness but it cracks badly. Neat MgO with $CaCl_2$ gives the strongest cement made, though it sets somewhat more slowly than MgO with $MgCl_2$.

Magnesite-sand-$CaCl_2$ mixture adheres to glass plates, shows no crack and no measurable shrinkage.

Specific Gravity.—Only a few determinations have been made:

	Sp. gr.	Per cu ft.
(C-1) Magnesite and $MgCl_2$	2.05	128
(A-1) Dolomite and $MgCl_2$	1.99	124
(C-5) Magnesite and $CaCl_2$	1.87	117
(A-5) Dolomite and $CaCl_2$	1.79	112

Sawdust is frequently used in this cement, making a very light product.

Tensile Strength.—The following tables show the results obtained on tensile strength. The briquettes were made in standard cement moulds and in making them the specifications of A. S. T. M. were followed except for the consistency of the material as above stated.

†Later investigations on many dolomites have proven this relation to hold for some dolomites only.

[2]Bole and Shaw, Transactions American Ceramic Society, 17, 125 (1915).

No data on *B* are given in the table since no cements having any strength were obtained from it.

DATA SHEET

Oxychloride Cement
Using Dolomite as Source of MgO

No.	Filler	Chloride	Per cent[1]	Sp. gr. sol. deg. Baume	C. c. sol. per 100 gr. mix	Tensile strength lbs. per sq. inch 14 days	28 days
A-1	$CaCO_3$	$MgCl_2$	54.6	25	36	540	620
A-3	$CaCO_3$	$MgCl_2$	35.9	20	32	590	720
A-5	$CaCO_3$	$CaCl_2$	48.7	25	32	80	165
A-7	$CaCO_3$	$CaCl_2$	35.9	20	32	92	125
A-9	$CaCO_3$	($MgCl_2$)	(24.4)	25	32	345	530
.....	.....	($CaCl_2$)	(24.4)	.....	.....	.....	.....
A-11	$CaCO_3$	($CaCl_2$)	(18.0)	20	32	125	295
.....	.....	.....	(18.0)	.....	.....	.....	.....
A-2	($CaCO_3$)	.....	.....	25	52	255	625
.....	(Sawdust)	$MgCl_2$	105.0	.....	.....	.....	.....
A-4	(Sawdust)	$MgCl_2$	44.5	20	32	475	625
A-8	(Sawdust)	$CaCl_2$	84.0	20	60	45	30
A-10	(Sawdust)	($MgCl_2$)	(48.0)	25	51	190	213
.....	.....	($CaCl_2$)	(48.0)	.....	.....	.....	.....
A-12	(Sawdust)	($CaCl_2$)	(39.0)	20	56	40	75
.....	.....	.....	(39.0)	.....	.....	.....	.....

[1]Per cent figures on basis of 100 MgO, that is, 54.6 per cent $MgCl_2$ equals 54.6 per cent of the MgO in the mix. Where sawdust is given, 20 per cent by weight of mix was used.

Using Magnesite as Source of MgO

No.	Filler	Chloride	Per cent[1]	Sp. gr. sol. deg. Baume	C. c. sol. per 100 gr. mix	Tensile strength lbs. per sq. inch 14 days	28 days
C-1	None	$MgCl_2$	18.0	25	60	105	60
C-3	None	$MgCl_2$	9.7	20	44	140	300
C-5	None	$CaCl_2$	16.6	25	52	610	1242
C-7	None	$CaCl_2$	11.0	20	50	677	556
C-9	None	($MgCl_2$)	(7.5)	.....	.....	.....	.....
.....	.....	($CaCl_2$)	(7.5)	25	50	383	902
C-11	None	($CaCl_2$)	(5.8)	.....	.....	.....	.....
.....	.....	.....	(5.8)	20	52	540	665
C-2	Sand	$MgCl_2$	21.7	25	19	650	650
C-4	Sand	$MgCl_2$	13.4	20	16	555	610
C-8	Sand	$CaCl_2$	15.1	20	18	333	358
C-12	Sand	($MgCl_2$)	(7.5)	.....	.....	.....	.....
.....	.....	($CaCl_2$)	(7.5)	20	18	347	420

[1]Per cent figured on basis of 100 MgO, that is, 18.0 per cent $MgCl_2$ equals 18.0 per cent of the MgO in the mix. Where sand is given, 75 per cent by weight of the mix is used.

The high shrinkage of the neat magnesite trials is shown to have produced weak briquettes, probably due to cracks, some of which were plainly visible.

While $CaCl_2$ solution has produced the best strength with neat magnesite, the $MgCl_2$ solution gives best results when sand is added.

In the dolomite *A*, the $CaCl_2$ briquette shows tensile strength decidedly lower than the magnesite. (Later results have shown that the $CaCl_2$ solution used here was too high in sp. gr., better results being obtained with sp. gr. around 12 to 14 Baume.)

The mixtures of dolomite and $CaCl_2$ are much softer than $MgCl_2$-dolomite mixtures but the magnesite-$CaCl_2$ trials are as hard as the magnesite-$MgCl_2$ after 28 days. No explanation of this apparent inconsistency has been found.

A study of the table would seem to indicate that the following conclusions would be borne out by experience:

1. Calcined magnesite must be diluted with some coarse aggregate to give satisfactory cement with $MgCl_2$.

2. Calcium chloride can be successfully used to give strong cements with calcined magnesite.

3. Cements obtained with dolomite and $MgCl_2$ are as good as any obtained with magnesite with equal MgO content and $MgCl_2$.

4. Both dolomite and magnesite give cements of higher tensile strength than portland cement.

The results obtained in these preliminary experiments indicated that this line of endeavor was well worth further pursuit. Three of the original questions which these experiments were designed to investigate have been answered, namely:

1. Free CaO resulting from overburning dolomite is decidedly injurious to oxychloride cement.

2. Dolomite does not contain sufficient MgO to give a good cement when properly calcined.

3. Calcium chloride can be used to replace magnesium chloride only under proper conditions.

Calcining Dolomite.—One question has not been answered by these experiments—that is, as to whether dolomite can be calcined commercially so as to give a uniform product. An extensive investigation of this point was made and successful results have been obtained on commercial scale. This will be the subject of a separate paper. It may be said here that it was found impossible to burn dolomites properly under ordinary conditions of calcining these materials. A process was developed in which all conditions, especially temperature and pressure, were carefully controlled and by which successful results were obtained repeatedly on ton lots of dolomite.

Properties of Stucco and Flooring

A further study of this subject[2] was made by selecting different dolomites, studying their structure and properties and making tile, laying them on wood in much the same manner as floors are laid of this cement.

Tests were made to determine the effect of: Fineness of grinding; temperature of cement during setting; humidity of the atmosphere during setting; strength of chloride solution; different kinds of coarse aggregate; expansion; weathering of finished product.

DATA—TESTS MADE BY DOW CHEMICAL CO.—MATERIAL CALCINED BY SHAW AND BOLE

Analysis of Calcine Material

	Canadian magnesite	Gouvenour dolomite A-1	Gouvenour dolomite A-2
Loss on ignition	19.50	31.70	33.95
SiO_2	1.30	1.53	.37
R_2O_3	1.25	.97	.22
CaO	12.72	34.50	37.85
MgO	66.60	27.20	27.80

Stucco mix, using $MgCl_2$ solution 22 deg. Baume

Canadian magnesite	1	Dolomite A-1	2.5	Dolomite A-2	2.5
Ground flint	2	Ground flint	1.0	Ground flint	1.0
Sand	5	Sand	4.5	Sand	4.5

	Tensile strength 1 day	3 days	7 days
Canadian magnesite body	408	402	400
A-1 Dolomite body	.....	.....	467
A-2 Dolomite body	258	428	488

		Per cent change in length 1 day	3 days	7 days
Canadian magnesite body	(normal air)	—.02	—.02	—.03
	(wet air)	+.006	—.004	+.025
A-1 dolomite body	(normal air)	+.18	+.28	+.31
A-2 dolomite body	(normal air)	+.04	+.06	+.06
	(wet air)	+.07	+.13	+.14

— Indicates contraction. + Indicates expansion.

		Water resistance Dry	Wet	Recovered	Per cent recovered
Modulus of Rupture	Candaian magnesite	1614	702	1605	98.0
	A-1	1596	768	969	60.7
	A-2	1890	990	1458	77.1

(Recovery of 50 per cent or more considered good)

[2]Much of this work was done in the laboratory of the Solvay Process Co. in co-operation with the writers.

Fineness of Grinding.—In general fine ground material gives highest tensile strength. Dolomite-magnesium chloride mixtures show the following tensile strength in seven days:

200 mesh	100 mesh	On 100 mesh
780	700	450
750	680	490
740	610	440
Average 760	660	460

Our experience has been, however, that too finely ground materials are more likely to crack in setting than those not so finely ground.

Temperature During Setting.—Tile made from dolomite and $MgCl_2$ solution 18 deg. Baume held at 80 deg. F. set hard in two hours and developed tensile strength of 550 lb. per sq. in. in two days. Ordinarily it requires 3 to 5 hr. for final set.

Humidity During Setting.—Test pieces placed in a damp box where relative humidity was high set very slowly, developing only 50 lb. per sq. in. in tensile strength in seven days. Did not set after taking from the box.

Weathering.—Briquettes made from coarsely ground dolomite-calcium chloride mixtures show following tensile strength:

Deg. Baume	7 days lb.	14 days lb.	2 years' exposure to weather lb.
13	180	210	390
13	150	200	430
14	160	185	420

This indicates that this material does not deteriorate badly in weather.

Tile made from these same mixtures have been exposed to the weather since August, 1919, and are in good state of preservation.

The data in this table indicate that calcium chloride with properly burned dolomite will give good cement.

Good results have been obtained with the tile containing from 13 to 25 per cent calcium chloride (percentage based on MgO present).

When magnesium chloride is used, the percentage of chloride runs higher.

Time of Setting.—These calcium chloride cements are almost invariably slower setting than when magnesium chloride is used.

	Initial set	Final set
Dolomite-$CaCl_2$	40 min. to 1 hr.	4 to 7 hr.
Dolomite-$MgCl_2$....30 min. to 50 min.		3 to 5 hr.

Fineness of the material and strength of chloride solution are important factors in determining time of set.

Fine material sets more rapidly.

Low sp. gr. calcium chloride solution promotes rapid setting.

Stucco.—If this material is to be used for stucco, it is essential that it withstand weathering; some of the data given above indicate that it will stand weathering if properly made. A very thorough investigation is necessary to determine many points as to how to improve its weather resistance. Other investigators, notably the Dow Chemical Co., are working on this problem and results they have obtained are worthy of note. They have investigated many brands of commercial cements as well as some which we have produced from dolomite. Incidentally it may be said that the dolomite product stands in the front rank. Their test shows the product made from dolomite compares favorably with the commercial stucco material on the market, in its ability to stand up under weathering test, which consists of making test pieces, allow them to set 14 days, spray them with water 24 hr. continuously, dry 24 hr., spray 24 hr. and dry, repeating for three successive days, then determine modulus of rupture (wet) and after allowing to dry two days.

These tests show that high strength of dry test piece does not indicate high resistance to weather and that fine aggregate promotes weather resistance. The dolomite cement has this advantage and probably owes its high weather resistance to it. Tests which they made on Canadian magnesite shown in the table gave exceptional results.

(To be continued)

DATA SHEET

Oxychloride Cements—Using Dolomite as Source of MgO
Cement Tile Laid ½ in. Thick on Wood
——Calcium chloride sol.——

No.	Per cent	MgO Per cent fineness	Per cent free CaO	Sp. gr. deg. Be.	C. c. per 100 gr. mix	Per cent	Results
10	25	7% on 100	1.0	14.3	46	30.9	Cracked but hard
14a	25	7% on 100	1.0	14.3	45	32	Shrinks in setting
17	27.5	100	1.0	14.3	38	19.9	Cracked, not troweled
17a	27.5	7% on 100	1.0	14.3	38	19.9	Cracked, not troweled
18	27.5	7% on 100	1.0	14.3	36	18.5	Good
19	27.5	7% on 100	1.0	14.3	31	19.9	Good
19a	27.5	200	1.0	14.3	31	19.9	Good
20	27.5	100	1.0	14.3	31	19.9	Good
20a	27.5	7% on 100	1.0	14.3	31	19.9	Good
22	27.5	7% on 100	1.0	13	31	18	Good
22a	27.5	7% on 100	1.0	12	31	16.6	Good
26	27.7	7% on 100	1.0	10	31	13.3	Good
26a	27.7	7% on 100	1.0	11	31	14.9	Good
27	27.7	7% on 100	1.0	12	31	16.4	Good
27a	27.7	7% on 100	1.0	13	31	18.0	Good
28	27.7	7% on 100	1.0	18	31	24.9	Sets slowly
28a	27.7	7% on 100	1.0	20	31	28.7	Sets very slowly, poor tile

What Is Sand?

SOME months ago in discussing in these columns the difficulties of technical nomenclature, mention was made of the ambiguities lurking in the definition of so simple a material as sand. In Washington just now this has official exemplification in a case before the Treasury Department. In the new tariff law "sand, crude or manufactured" is on the free list, and "silica, crude," is taxed $4 per ton.

"When is silica sand?" and vice versa, are questions now being asked the Customs Division. An accepted authoritative definition of sand would no doubt help the government in its ruling. The obligation resting collectively on engineers to establish precise nomenclature extends far beyond the immediate needs of the profession.—*Engineering News-Record.*

Testing Sprinkling Filter Stone by Freezing and Thawing

INVESTIGATIONS on the durability of stone for use in the sewage sprinkling filters under construction in Lincoln, Neb., says *Engineering News-Record*, have been made by alternately freezing and thawing the material. The samples were frozen and thawed 34 times.

A sample from a quarry in Louisville, Neb., dark blue and somewhat porous, was broken to a size that all pieces could be retained on a ¾-in. screen. At the test conclusion, 56 per cent was retained by ¾-in. mesh; 19 per cent on four-mesh, and 25 per cent passed a four-mesh. In a further test the stone would probably have been disintegrated to a powder.

The testing method used was fair as shown by examination of the stone in the filters at Broken Bow and Harvard. Each of these filters has been exposed for two winters. The stone is badly disintegrated and will be replaced within two years.

Gravel from Meadow, Neb., was of such a size prior to the test that it was all retained on a four-mesh screen; after the test 7½ per cent had so broken up that it passed a four-mesh screen.

Iowa plants use Sioux Falls granite and limestone; the first indicates satisfactory results. It is believed that cities should be allowed to use limestone if it is understood that it may need replacing every 10 or 15 years; it is found cheaper to do this than to ship in granite. Limestone in use for six years at Mason City shows some disintegration, but it will last many more years.

In South Dakota the quartzite in the Aberdeen filter plant has been in use for eight years without showing disintegration. It is probable that the Sioux Falls quartzite will be used inasmuch as climatic conditions in Nebraska are similar to those in North Dakota and Iowa, where the winters are often severe. The plant will be completed next spring ready for the reception of the stone, of which 33,000 tons will be needed.

Better Service from Refractories

The cement, lime, and gypsum industries are going to profit from the research work described below. But their profit will be measured largely by the spirit and the volume of the response from individual producers to this request for information. On these replies investigation and conclusions are to be based

RESEARCH in refractories — particularly in connection with the manufacture of refractory brick — has been largely confined to laboratory work. Yet the need for such research is great, and its results would be particularly important to lime, cement, and gypsum producers. At the Cleveland convention of the National Lime Association last June a lively and spontaneous discussion of refractories sprang up on the floor of the meeting.

A movement has been started which has for its purpose the uncovering of a mass of information with regard to the furnace conditions which confront refractories in actual service. It takes the form of an industrial survey, which will be conducted by the Refractories Manufacturers Association in co-operation with committees which have already been appointed in associations of users of refractory brick and with individuals, firms, and corporations to whom refractory brick is an industrial necessity.

This survey will consume the better part of two years and it is hoped that preliminary reports will be made at the end of the first three months, the first half year and so on, until the survey is completed. These reports will cover the information which will be gathered by using the rather elaborate questionnaire which is shown here; this questionnaire will be distributed to consumers of refractory brick in the 13 industries to which the bulk of this material goes. These include cement, lime, and plaster kilns and kilns for burning ceramic products.

The questionnaire covers temperature and combustion conditions found in the typical furnace, abrasion, slag action, the presence or absence of uncommon furnace gases, spalling conditions, loads, insulation, character of draft, and so on. This information will be sought in the industries named and the answers to the questionnaires will be sent to the Mellon Institute of Industrial Research at Pittsburgh.

When enough information has been received to warrant the issue of a progress report in any single industry, this report will at once be made; it will include a statement of the more general and possibly typical conditions, with data relative to conditions which would properly be considered exceptional in that industry. Meager as these progress reports may be, they will be an important addition to present knowledge.

Attention has been called to the rapidly changing conditions in many industries, caused by the necessity of obtaining greater production from each unit. To meet these conditions, brick of entirely different characteristics have been developed. In a great many cases no attempt has been made to co-ordinate the changes in requirements with the changes in the refractory material. This has resulted, in many cases, in the use of refractories which, while seemingly well suited for the purpose, did not and could not live up to their reputation. A study of furnace conditions often develops the cause of the trouble; so it is thought that a similar study will develop these conditions in advance of expensive failures.

Every consumer of refractory brick will derive a certain benefit from the successful prosecution of the work described. Wastes will be eliminated, which cannot help but reduce production costs. Intelligent service will follow authentic knowledge of requirements. The whole movement augurs well for the industry which is launching it and for every industry which finds refractory brick a necessary part of its plant equipment.

The questionnaire referred to, in addition to the questions reproduced, bears the following announcement:

"The Committee on Industrial Survey has been organized to obtain complete information regarding the furnaces in which refractory materials are used. It has been suggested that this information may be secured from the following sources:

1. Co-operation with consumers.
2. Co-operation with national trade associations.
3. Co-operation with Bureau of Standards, Washington, D. C.
4. Co-operation with engineering societies, or
5. Co-operation with manufacturers of furnace equipment.

"It is suggested that each report cover only a limited field for there are often many modifications in the design and operation of each particular type of furnace. Because of these variations the refractory problems are sometimes entirely different and a large number of separate reports may be necessary. Additional blanks for making these reports may be obtained from F. W. Donahue, secretary of the Refractories Manufacturers' Association, Oliver building, Pittsburgh, Pa., upon request.

"They should be returned to R. M. Howe, vice-general chairman, Senior Fellow, R. M. A. Fellowship, Mellon Institute of Industrial Research, Pittsburgh, Pa."

POINTS IN MAKING SURVEYS

I. General Information

1. Type of furnace.
2. Location and owner (or in some cases society, association, etc.).
3. Product of furnace.
4. Fuel.
5. Rough sketch giving dimensions and names of furnace parts.
6. Brief description of process. (This should cover the raw materials used and the reactions taking place in the furnace.)
7. What kind of refractories (fire clay, silica, magnesite, chrome, etc.) are used in this furnace and if more than one, where is each applied?
8. How many brick of each kind are used (separate into 9-in., 9-in. series shapes, shapes other than those in the 9-in. series, etc.)?
9. How often must the furnace or parts be renewed?

II. Temperature and Combustion

10. How rapidly is furnace heated up?
11. What is the maximum temperature attained?
12. What variations in temperature?
13. Are oxidizing or reducing conditions maintained within the furnace?
14. Is the draft artificial or induced, positive or negative?
15. How are combustion conditions?

III. Abrasion

16. Ascertain whether or not the refractories are subjected to abrasion—either from rapidly moving gases, clinker, slag or metal. If abrasion is an important factor, describe the final result of this action.

IV. Slag Action

17. Are the refractories subjected to the action of molten slag or metal? If so, state how, when and where it occurs, its composition and effect.

V. Action of Gases

18. Are such gases as chlorine, phosgene, carbon monoxide, sulphur dioxide or other uncommon furnace gases present? If so, what is their effect?

VI. Spalling

19. Does spalling take place? If so, is it moderate or excessive? Describe.

VII. Load Conditions

20. To what pressure are the brick subjected? (In pounds in square inch, courses of brick or height of brickwork.)
21. Are they heated throughout as in checkers or on one side as in a roof or sidewall?
22. Are they warped or distorted when removed?
23. Are they insulated?
24. Is combustion maintained by forced draft?

VIII. Special Mention

25. While most of the points of general interest are covered in this proposed plan of procedure, any special conditions should be noted in detail.

A Full Program for Quarry Owners and Managers

Program of the Sixth Annual Convention of the National Crushed Stone Association, La Salle Hotel, Chicago, Ill., January 15, 16 and 17, 1923

THE program below is presented by the program committee of the National Crushed Stone Association (W. Scott Eames, Wm. H. Hoagland, John J. Sloan, A. P. Sandles and Nathan C. Rockwood) with a thorough appreciation of its being a very full one for three brief days. However, if the sessions are begun on time, and the papers to be presented are in the hands of the committee before the convention, so that they may be printed and distributed at the convention, it is expected not only to have the benefit of the expert knowledge in these papers, but full discussion of them by quarry men as well.

Arrangement has been made by the chairman of the program committee to have the convention fully reported; and Rock Products has made an agreement with the Association to publish the proceedings of the convention in full, indexed, and carefully edited, compiled and arranged, not later than March 10, 1923.

The program committee honestly believes that this is the one big opportunity of quarry owners and managers to get together and learn some things about the quarry business, as well as get acquainted and enjoy themselves. Hotel reservations should be made promptly and those making reservations should tell the hotel management that they are coming to attend the Crushed Stone Convention; for special provision has been made to take care of quarry men.

MONDAY, JANUARY 15

10:30 A.M.—**Address of Welcome.** By Charles R. Francis, Commissioner of Public Works, City of Chicago

10:45 A.M.—**President's Address**

11:00 A.M.—**Report of the Secretary and Treasurer**

11:15 A.M.—**"Business Principles Applied to Quarry Development and Stone-Crushing Operations — What Factors Make a Rock Deposit Worth Developing; Market Possibilities; Trade Ethics, and Factors Which Influence the Investment of Capital."** By W. C. Huntington, Associate of E. C. Welborn, Business and Engineering Counsel, Chicago, Ill.

These engineers specialize on examinations and reports of industries for bankers and capitalists. Mr. Huntington's analysis of the quarry industry as a *business* to invest capital in will be an education to every quarry owner.

11:30 A.M.—**"Transportation Situation Reviewed."** By E. J. Krause, Past-President of the N. C. S. A. and Vice-President and General Manager of the Columbia Quarry Co., St. Louis, Mo.

Mr. Krause is one of the principal coal operators in Southern Illinois as well as a quarry operator, and his "hunches" on the transportation situation have proved mighty accurate in the past.

12:00 A.M.—**Discussion of Transportation Situation**

MONDAY NOON

12:30 A.M.—**Luncheon by Groups** in separate rooms on the mezzanine floor. Rooms to be announced at the morning session. Special table d'hote luncheon served.

(A) Agricultural Limestone Producers
(B) Ballast Producers
(C) Concrete Aggregate Producers
(D) Granite Producers
(E) Machinery and Equipment Manufacturers

These luncheons will furnish an opportunity for producers interested in special products to discuss their mutual interests in confidence. The luncheon of the machinery and equipment manufacturers will be for the purpose of organizing these manufacturers as an adjunct of the National Association and schemes for closer co-operation will be discussed.

2:00 P.M.—**"Visualizing the Possibilities of Stone Quarries."** By Waller Crow, of Waller Crow, Inc., Engineers and Financial Advisors, Chicago, Ill.

Mr. Crow is a man with vision. The day may come when crushed stone will be but a byproduct of practically every quarry operation. Rocks of all kinds are *minerals*, and yearly more and more uses are being found for these common minerals. The future of dolomite, for example, presents striking possibilities. Mr. Crow's paper will start you speculating on the real value of your quarry property.

2:15 P.M.—**"Information and Data a Banker Wants to Know About a Quarry Industry."** By J. E. Lindquist, Vice-President, Central Trust Co., Chicago, Ill.

Mr. Lindquist is a vice-president of one of Chicago's largest trust companies. He has been a quarry operator and has financed quarry operations as a banker It will be a rare treat to quarry men to get his angle on the quarry industry.

2:30 P.M.—**"Valuation of Stone Deposits, Including Exploration of Quarry Property; Geological Data; Exploitation Possibilities, Etc."** By Joel H. Watkins, Mining Geologist, Leesburg, Va.

Mr. Watkins is one of few practical geologists who has a special knowledge of commercial quarry operation. He has investigated and reported on a number of valuable limestone deposits.

2:45 P.M.—**Report of the Research Committee,** Harry H. Brandon, Ohio Marble Co., chairman. Professor Withrow, research specialist of Ohio State University, Columbus, Ohio, will be a guest of the committee and explain in detail a proposed research program for the N. C. S. A.
General Discussion of the Report of the Research Committee

3:30 P.M.—**"Trade Association Activities."** By J. M. Pritchard, Secretary-Manager of the Hardwood Manufacturers' Institute, Chicago, Ill.

Quarry men will recall that the original association of hardwood manufacturers was dissolved by order of the Federal Court at Memphis, Tenn. Since then the hardwood manufacturers have had many conferences with the Department of Commerce and the Department of Justice at Washington. Mr. Pritchard will tell quarry men some of the things a trade association can now do legitimately.

MONDAY EVENING

7:30 P.M.—Showing of a four-reel film by the U. S. Bureau of Mines, entitled **"The Modern Goliath,"** or the story of heavy excavating machinery. The showing of this film will last about 45 minutes and will be followed by an informal discussion of modern quarry equipment and quarrying costs.

TUESDAY, JANUARY 16

Dr. Oliver Bowles, Chairman

9:00 A.M.—**Introductory Address.** By Dr. Oliver Bowles, Mineral Technologist, United States Bureau of Mines, Washington, D. C., on his studies of quarry practice and methods, illustrated by lantern slides and motion pictures; with special reference to stripping operations.

Discussion of Stripping Methods and Costs. By W. N. Spencer, Independence, Mo.; W. S. Charles, Charles Stone Co., Marion, Ill.; John J. Sloan, Chicago, Ill., and others.

9:30 A.M.—**"Drilling and Blasting"** (illustrated with lantern slides). By J. Barab, Engineer, Hercules Powder Co., Wilmington, Del.

Mr. Barab and other engineers of the Hercules Powder Co. have made a national survey of quarry operation. His paper will be illustrated by lantern slides and possibly motion pictures.

9:45 A.M.—**Discussion of Drilling and Blasting.** Led by paper by Alexander McKerman, Superintendent, New Haven Trap Rock Co., New Haven, Conn., with motion pictures of this company's remarkable operation.

10:00 A.M.—**"Blasting Experiences in a City."** By Otho M. Graves, Assistant to the President, General Crushed Stone Co., Easton, Pa.

10:15 A.M.—**"Handling Stone in the Quarry and Quarry Transportation."** By Dr. George E. Ladd, U. S. Bureau of Public Roads, Washington, D. C., formerly of the U. S. Bureau of Mines.

Dr. Ladd made a thorough-going survey of quarry operation for the Bureau of Mines. He has some interesting observations to make on the comparative costs at various quarries and with various types of operating methods.

10:30 A.M.—**General Discussion of Quarry Transportation.** Led by F. T. Gucker, of the John T. Dyer Quarry Co., Norristown, Penn., with illustrations of the use of motor trucks for hauling from quarry to crushers; and Norman Hely, of Cape Girardeau, Mo.

10:45 A.M.—**"Steam-Shovel Operating Costs."** By A. C. Vicary, Vice-President of the Erie Steam Shovel Co., being the first public announcement of the results of the Erie Steam Shovel Co.'s Prize Contest on Steam-Shovel Operating Records.

11:00 A.M.—**"Gasoline Quarry Locomotives."** By H. R. Sykes, Fate-Root Heath Co., Plymouth, Ohio.

11:15 A.M.—**"Reducing the High Cost of Accidents."** By Sidney J. Williams, Chief Engineer, National Safety Council.

11:30 A.M.—**General Discussion of Quarry Labor.** Led by President W. Scott Eames and F. W. Schmidt, Morristown, N. J.

TUESDAY NOON

12:30 P.M.—**Luncheon by Territorial Groups in Separate Rooms on the Mezzanine Floor.**

(A) Eastern
(B) Central Western
(C) Southern
(D) Far Western

2:00 P.M.—**"The Jaw Crusher as a Primary Breaker."** By C. G. Buchanan, President of C. G. Buchanan Co., New York City.

2:15 P.M.—**"The Gyratory Crusher as a Primary Breaker."** By W. J. Roberts, President of the Traylor Engineering and Manufacturing Co., Allentown, Pa.

2:30 P.M.—**"Roll Crushers as Primary Breakers; and Secondary Breakers, Screening and Sizing."** By Brownell McGrew, Engineer, Allis-Chalmers Mfg. Co.

2:45 P.M.—**"Washing and Separation of Sizes by Hydraulic Methods."** By Edmund Shaw, Consulting Engineer, Chicago.

3:00 P.M.—**General Discussion of Crushing and Screening.** Led by L. H. Steward, Consumers Co., Chicago.

3:15 P.M.—**"Storage and Shipping"** (illustrated with lantern slides). By Gordon Smith, of J. C. Buckbee Co., Chicago, Consulting Engineers.

Discussion of Storage and Shipping. Led by C. A. Freiberg, General Manager, Buffalo Cement Co., Buffalo, N. Y.

3:30 P.M.—**General Discussion of Quarry Operation.**

4:00 P.M.—**Ten-Minute Papers on New Equipment and Devices.**

"A New Type of Shovel for Crushed Stone Handling." By George E. Deatherage, General Manager, The Hoar Shovel Co., Duluth, Minn.

"New Roller Grizzly." By Thomas H. Robins, Jr., Robins Conveying Belt Co., New York City.

"Steel-Belt Conveyors." By Harry Carlson, Manager, Sandvik Steel, Inc., New York City.

"Electric Storage Battery Locomotives." By C. W. Chappelle, Ironton Engine Co., Ironton, Ohio.

Other manufacturers have equal opportunity to present new developments in equipment and machinery.

TUESDAY EVENING

6:30 P.M.—**Annual Banquet of the National Crushed Stone Association.**

Prominent guests and speakers will include W. H. Finley, President of the Chicago and Northwestern Railway; J. E. Gorman, President of the Chicago, Rock Island and Pacific Railway; C. H. Markham, President of the Illinois Central Railroad; C. E. Spens, Vice-President in Charge of Operation, Chicago, Burlington and Quincy Railroad; Dr. W. H. Hatt, Chairman of the Highway Research Committee, American Engineering Research Council, Washington, D. C.; Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads; E. J. Mehren, Editor of Engineering News-Record; T. J. Wasser, President, and James H. MacDonald,Treasurer, of the American Road Builders' Association.

The entertainment features of the banquet program will include instrumental music, songs and "stunts" by the Chicago University Glee Club of 20 members. This entertainment will be contributed by Chicago producers, E. J. Krause, of St. Louis, and Rock Products.

WEDNESDAY, JANUARY 17

10:00 A.M.—**"Cost Accounting Principles and Their Application to the Crushed Stone Industry."** By George W. Hafner, Expert Cost Accountant, Chicago.

10:30 A.M.—**Discussion of Cost Accounting.** Led by Otho M. Graves, Assistant to the President, General Crushed Stone Co., Easton, Pa.; H. E. Bair, General Manager, France Stone Co., Toledo, Ohio.

11:00 A.M.—**"Merchandizing Quarry Products."** By George E. Schaefer, Sales Engineer, General Crushed Stone Co., Rochester, N. Y.

11:15 A.M.—**"Merchandizing Crushed Stone Products."** By R. W. Scherer, Sales Engineer, Western Lime and Cement Co., Milwaukee, Wis.

11:30 A.M.—**"Merchandizing Crushed Stone Products."** By Harry H. Brandon, Ohio Marble Co., Piqua, Ohio.

12:00 A.M.—**General Discussion on Merchandizing Quarry Products.** Led by F. W. Schmidt, Morristown, N. J.

WEDNESDAY NOON

1:00 P.M.—**General Luncheon in the Red Room.**

2:00 P.M.—**"Stone Screenings as Fine Aggregate for Concrete."** By Prof. Duff A. Abrams, head of the Structural Materials Research Laboratory, Lewis Institute, Chicago.

2:15 P.M.—**"Crushed Stone Railway Ballast."** By Theodore Bloecher, Jr., Division Engineer, Baltimore and Ohio Railroad, Baltimore, Md., representing the Ballast Committee of the American Railway Engineering Association.

2:30 P.M.—**"Blast-Furnace and Open-Hearth Furnace Fluxing Stone."** By J. H. Campbell, Engineer, R. W. Hunt & Co., Testing Engineers, Chicago.

2:45 P.M.—**"Co-operation in Industrial Research With Special Reference to the Fire Tests of Reinforced-Concrete Columns and the Showing Made by Crushed Stone Aggregates."** By S. H. Ingberg, Physicist, United States Bureau of Standards, Washington, D. C.

3:00 P.M.—**"Agricultural Limestone."** By John T. Woodruff, Springfield, Mo.

3:15 P.M.—**"Special Uses of Crushed Stone."** By John J. Sloan, Secretary, Wisconsin Granite Co., Chicago.

3:30 P.M.—**General Discussion of Uses of Crushed Stone.**

4:00 P.M.—**Election of Officers.**

4:30 P.M.—**Meeting of Board of Directors.**

Flowers and Grass Save Money at this Sand and Gravel Plant

A Pennsylvania sand and gravel producer plants flowers and sows grass about the office building, thus inciting general clean-up movements in all the departments

MANY managers and superintendents in the rock products industries have said at one time or other: "One of these days we'll sow grass and plant some flowers and make the office surroundings neat and attractive." At some plants "one of these days" arrives. The result is pleasing and the employes take pride in the attractiveness of it. But when winter comes, the grass and flowers are forgotten, rubbish accumulates, the flowers are dead and the lawn is cut up by wagons and trucks. Then, when spring arrives, the management is so busy taking care of business, making changes in the plant and getting the organization together, that the grass and flowers are not given the required attention.

But this does not apply to the plant of the Universal Sand Co. When R. G. Hengst joined the organization as president and general manager one of the first things he did was to beautify the surroundings of the office building. Flower beds were made, window boxes for flowers were built and the lawn graded and grass sown. The edges of the flower beds and the lawn were lined with large white-washed boulders.

The result reached Mr. Hengst's expectations, for the plant superintendent, machine-shop and aggremeter foremen, blacksmith, master mechanic, pump house man, the car loaders, enginemen and pit men—all took pride in the idea and of their own accord extended the movement to their departments.

While they didn't plant flowers or sow grass, they did clean up. The plant and the grounds were cleared of all rubbish; scraps of iron, steel and lumber were neatly piled; the buildings were painted both inside and out; the machines were cleaned and oiled, and the whole operation in general felt the effects of the clean-up movement.

As a result of the men's attitude and in order to continue the plan, the company gives monthly prizes to the department having the neatest and cleanest appearance.

An inspection is made each month by a person not connected with the company. As the men never know when the inspection is being made, the departments are in conse-

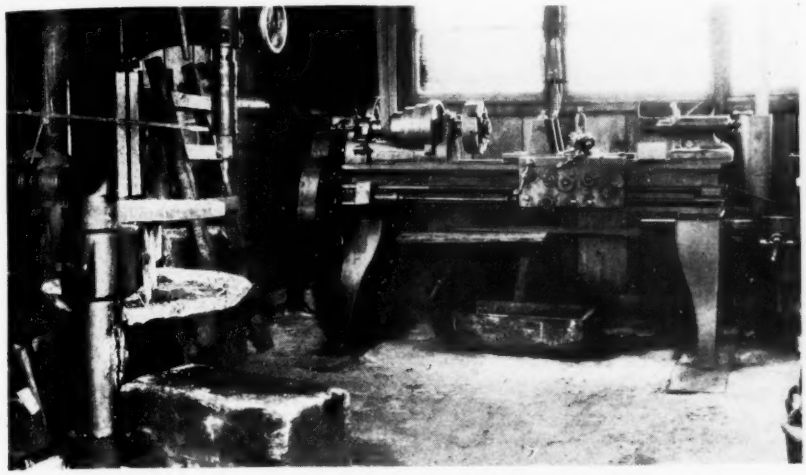
"IF we have grass and flowers in our yards at home, why not also have them at the plant where we spend the greater part of our daylight time?" asked R. G. Hengst of the Universal Sand Co., New Castle, Pa. "The men are inspired by the idea of cleanliness and as a result have put it to work in their own departments."

The office and lawn of the Universal Sand Co. It's a model, isn't it?

The other side of the office. President Hengst is standing on the left, and on the right is J. J. Emes, vice-president and superintendent. In the center are the bookkeeper, timekeeper, and stenographer

quence kept in good condition at all times, and improvements are added regardless of inspection time.

Directly as a result of the clean-up policy because waste, whether it is of paper or lumber, would necessitate cleaning it up; the life of the machinery is lengthened because it is kept cleaned and properly oiled,



This neat, clean machine shop is the result of the company's example set in making its grounds attractive

—indirectly as a result of the flowers and sodded lawns—the company is saving money. Material is not wasted as freely as formerly and duplicate repair parts of parts already on hand are not bought as formerly, because of the ones on hand being misplaced.

Increased Activity in Manufacture of Cement

THE Department of Commerce announce that reports made to the Bureau of the Census show a considerable increase in the activities of the establishments engaged primarily in the manufacture of cement during the year 1921 as compared with 1919. The total value of products reported amounted to $203,627,000 in 1921 and $175,265,000 in 1919, an increase of 16.2 per cent.

The increase in production was accompanied by increases in the number of persons employed, in the total amount paid during the year for salaries and wages, and principally in the cost of materials used. Of the 125 establishments reporting in 1921, 21 were located in Pennsylvania; 12 in New York; 11 in Michigan; 9 in California; 8 in Kansas; 6 in Ohio; 5 each in Illinois, Indiana, Missouri, and Texas; 4 each in Alabama, Iowa, Utah, and Washington; 3 in Minnesota; 2 each in Colorado, Maryland, Montana, New Jersey, Oklahoma, Oregon, and Tennessee; and 1 each in Georgia, Kentucky, Nebraska, Virginia, and West Virginia. Pennsylvania, the leading state in the industry in 1921, produced 26.8 per cent of the total value of products in that year.

There was some fluctuation in the number of wage earners employed each month during 1921. In September, the month of maximum employment, 28,043 wage earners were reported and in January, the month of minimum employment, 22,198—the minimum representing 79.2 per cent of the maximum. The average number employed during the year was 26,231 in 1921 as compared with 25,524 in 1919. A classification with reference to the prevailing hours of labor in the establishments in which employed shows that for 10,312, or 39.3 per cent of the total (average) number of wage earners, the prevailing hours were over 60 per week; for 6,157, or 23.5 per cent, 60 per week; and for 7,419, or 28.3 per cent, between 54 and 60.

The returns indicate that the combined output of all establishments was approximately 66 per cent of the maximum capacity, based upon a demand requiring full running time.

The statistics for 1921 and 1919 are summarized in the following statement. The figures for 1921 are preliminary and subject to such change and correction as may be found necessary from a further examination of the original reports:

COMPARATIVE SUMMARY OF STATISTICS FOR THE CEMENT INDUSTRY, 1921 AND 1919

	1921*	1919*	Pct. of increase†
Number of establishments	125	123	1.6
Persons engaged	30,907	30,247	2.1
Prop's and firm members	16	9	....
Salar'd empl's.	4,660	4,714	—1.1
Wage earners (av. number)	26,231	25,524	2.8
Salary and wage payments	$44,959,000	$42,691,000	5.3
Salaries	10,543,000	9,496,000	11.0
Wages	34,416,000	33,195,000	3.7
Contract work	302,000	266,000	13.5
Cost of materials	102,360,000	79,510,000	28.7
Val. of products	203,627,000	175,265,000	16.2
Value added by manufacture‡	101,267,000	95,755,000	5.8

*Figures given for 1921 do not include one establishment reporting products below $5000 in value. The figures for 1919, however, include two establishments of this class.

†A minus sign (—) denotes decrease. Percentages omitted where base is less than 100.

‡Value of products less cost of materials.

The following table gives detailed statistics relative to the production of cement, as reported by the United States Geological Survey:

Products, total	1921	1919	Pct. of increase*
value	$203,627,000	$175,265,000	16.2
Cement:			
Barrels	99,063,000	81,307,000	21.8
Value	$184,801,000	$138,714,000	33.2
Portland:			
Barrels	98,293,000	80,778,000	21.7
Value	$183,808,000	$138,130,000	33.1
Av. unit val.	$1.87	$1.71	.....
Natural and puzzolan:			
Barrels	770,000	529,000	45.6
Value	$993,000	$584,000	70.0
Av. unit val.	$1.29	$1.10	.....
All other products (inc. containers): Val.	$18,826,000	$36,551,000	—48.5

*A minus sign (—) denotes decrease.

New York Builders' Supply Directory

DURING the past six months the New York State Builders' Supply Association has been making a personal canvass of every city, town, and hamlet in the state of New York, and will publish a directory complete in every detail, containing a list of all dealers in building supplies. Approximately 12,000 miles have been covered in gathering data and information for this directory, which will be off the press about December 1.

The directory, made up in pocket size, will contain the names of over 1450 dealers and more than 800 towns. It will be subdivided by counties and cross indexed by towns, and will contain the population according to the census of 1920. A great deal of time and money has been spent to make this directory accurate and up-to-the-minute. It is being put out in such shape that it will fill a long-felt need for use by sales managers and sales representatives in the various sections of New York state.

Only a limited number of copies will be printed, and those interested in such a directory may obtain information by communicating to the secretary, 907 Electric building, Buffalo, N. Y.

The Design of Sand Plants

No. 1—Plants producing washed sand, and not sand and gravel, are built in many widely varying forms. These articles discuss some of the forms and show improvements which have recently been made in the design of such plants to make them produce a better quality of sand

By Edmund Shaw
Consulting Engineer, Chicago

PLANTS which produce washed sand, and not sand and gravel, are to be found in many localities of the United States. This is due, in part, to market conditions, and in part, to the fact that certain localities contain only deposits of sand, the gravel being in such small quantity that its recovery is not profitable.

The greater number of these sand deposits are river bars, which are mined by suction dredges, but there are other deposits in which dredges cannot be used, either because there is not enough water or because the ground is too valuable for other purposes to permit it to be dredged. So sand plants are divided into two classes, those for which the material is dredged and those for which the material is mined by a dragline, steam shovel or other form of excavator.

The simplest of the sand plants are those used in connection with a dredge, as these combine the various steps of plant operation. All sand and gravel production includes these steps: mining the crude material, washing, screening, dewatering, storing the washed product, and loading it for transportation. In the case of a suction dredge, pumping only sand, the mining and washing are combined in one operation; there is no screening (except the passing of the crude material through a simple stationary screen to remove trash and a little oversize), and the dewatering, storing and loading into cars are all performed by a single device, a settling tank.

As simple as these sand plants may be, they are built in a variety of forms to conform to local conditions and the previous experience of the operator. Some of these forms do a great deal better work than others, and some of them are too needlessly complicated. Their simplicity may be carried to a point where they will not do good work, an example of this being found in those operations in which sand is pumped directly into railway cars without being first passed through a settling box to free it from the muddy water. Such operations do not last long, as a general thing, for the quality of the material produced is poor. Even though there is only a little mud in the water, this will settle in the pockets formed in the sand while the loading is going on, resulting in streaks of mud all through the car, and especially in the corners.

The Ordinary Mid-West Sand Plant

The layout of a plant of the sort that may be counted almost by the dozen along the banks of some of our mid-western rivers is illustrated in Fig. 1. It consists of a suction dredge, a pipe line leading to the shore and a settling box, or bin, placed right to allow the settled sand to run into a railroad car. There is a stationary screen in the launder that leads across the top of the box and this keeps out much of the trash and oversize.

The word "settling box" is used here, but the apparatus is also called a "tipple" (which it is not), a sand bin, or tank, or other name, according to local usage.

In laying out a plant of this kind, it is usual to keep everything as low as possible in order to avoid pumping against a high head. The settling box is set at sufficient height to allow the sand to run into the cars and it is not made any larger than is necessary to store a little sand other name, according to local usage. haps a surplus to carry it through a short shutdown of the dredge. No way of getting the sand into another form of storage is provided, and if there is a shortage of cars or of orders, the plant simply does not run.

Keeping Down the Pumping Head

The desire to keep down the head against which the pump must work seems to have obsessed some of the builders of such plants, who have gone to the extreme of putting the settling box below the level of the ground. Fig. 2 shows a section through the part of such a plant which is on the shore. The settling box in this case is a round pool, or cistern, lined with concrete. The sand is recovered from this cistern by means of a locomotive crane, which places it on a stock pile or loads it directly into cars.

Out of a number of plants, these two have been chosen for discussion because they are typical. Nothing will be said concerning the dredge, as these articles will treat only of the washing and recovering of the sand, and not of the mining method, except insofar as it affects the

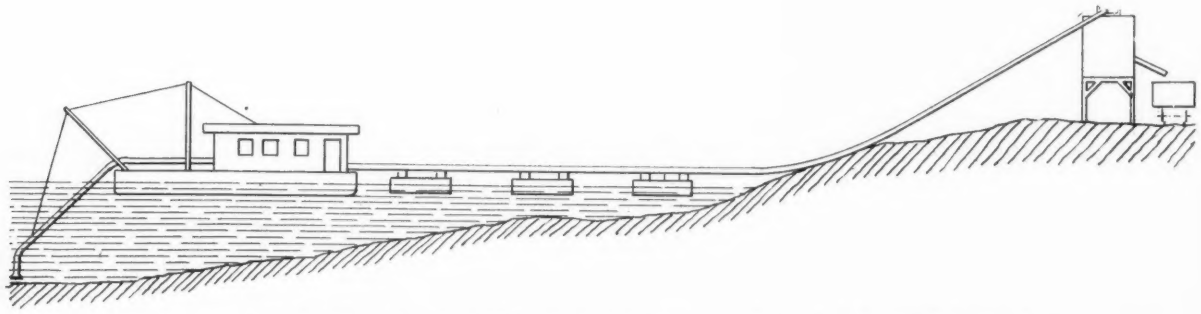


Fig. 1—A section through a typical sand plant handling sand pumped from a lake or river

washing practice and the plant design.

In the first-mentioned plant the settling box is the principal feature—in fact, one might say that it is the whole plant. As generally built, it is from 24 to 30 ft. long and from 10 to 12 ft. wide. The depth is ordinarily about 12 ft. Sometimes it is built with a hopper bottom, but more often the sand is allowed to make its own slope.

The flow of water into the box may be from end to end or from side to side, but commonly it is from end to end. A usual arrangement is to run the stream in a launder, or trough, the length of the box. In the bottom of this launder are cut out spaces which are covered with screens, and the sand falls through these screens into the bins beneath if the box is divided into bins. It is a common practice to put a finer screen in the last of these open spaces to separate the finer sand, which is called mason sand, brick sand or plastering sand, according to the locality. This finer sand, of course, falls into a separate bin.

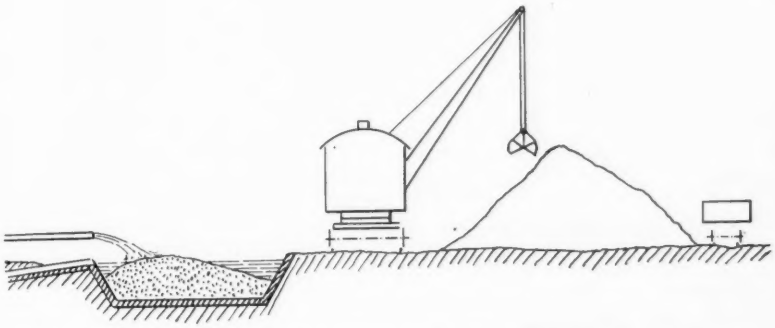


Fig. 2—The sand is settled in a cistern below the ground level to reduce the head against which the pump must work

Crude But Often Efficient

From the standpoint of the designer, this arrangement is crude, but it often gives quite satisfactory results in practice. This is due to the nature of the deposits from which the sand is pumped. They are usually of what is known as wash-in sand, or make-in sand, which is renewed by the river, in some cases constantly, and about as fast as it is pumped; in other cases only at the stages of high water. Such sand is *classified* sand. It has been sorted out from a great quantity of material which has been removed from the banks of the river by erosion, and carried into it from the watershed with heavy rains. The fine silt which originally accompanied it has been carried away by the current, and the little gravel which came into the river with it has long since settled and been left behind.

Being classified in this way, with the silt and objectionable fine sand taken out, and containing little or no gravel, such sand is practically ready for the market. The settling box need not have any other function than that which is implied by its name, that of settling the sand. All the other functions of a sand recovery device have been performed by the river.

Trouble begins when this simple form of settler is used with another kind of sand. It usually happens that as the business grows, the make-in sand is insufficient to supply the market and the dredge is set to work on some of the bars of fine sand that line the banks of the stream. Even where there is still sufficient make-in sand, there is likely to be trouble from mud and silt, after a considerable period of operation. Holes have been dredged into the river bottom in which, at certain stages of the river, mud is deposited, and when the suction of the pump strikes one of these holes a very dirty sand is settled in the box, often too dirty to be marketable.

The difficulty with such a settling box is that it is too large to be a good washing device or a classifier. It has been built in this way to obtain some storage capacity, but still it has not much to recommend it as a storage device because it will hold only a carload or two at most.

To be a good washing device, the settling box must also be a good classifier. This means that the settling area must be cut down to where the sand which is finer than the desired sizes will not settle. Such a box will also be a good washer, because if the fine sand will not settle, it is certain that the mud will not.

In some cases it has been possible to make such a settling box as has been described do good work by merely cutting it in two with a partition. Each half had then the proper area required for good settling. But such an arrangement is only a makeshift and not to be recommended as against putting in a proper sand-recovery plant. The shape of the box and the way the feed is admitted have a considerable influence upon the settling. There must be no dead corners where the mud can settle.

Product at the Mercy of the Gateman

The settling box is usually worked with gates attached to levers which are brought up to the top of the box, and the way these levers are handled has a lot to do with the settling. The man in charge sets these levers to the point where his experience tells him that only the settled sand will run out, but the feed of sand varies so much that he must watch and change the levers continually if he would prevent the box from filling up and wasting sand or prevent the water from running into the car. It usually happens that two or three times during the time that a car is being filled, a shot of dirty water will enter the car to deposit a layer of mud as the water filters away through the sand.

This difficulty with the gates may be obviated somewhat by thoroughly instructing the men as to the necessity of

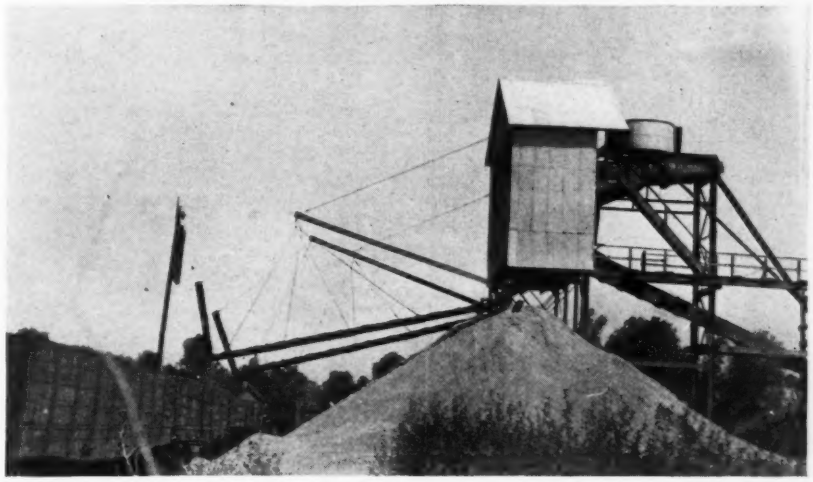


Fig. 3—An improvement on the ordinary plant, using automatic settling tanks to wash and classify the sand and providing storage space

keeping water out of the car, and then seeing that the men live up to the instructions. Sometimes the men form the bad habit of throwing in a stream of water as soon as the car is filled, in order to wash the sand around and trim the car.

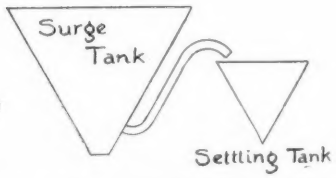


Fig. 4—A "surge tank," to absorb variations in the feed to settling tanks

Cleaner sand will result if a shovel is used for car trimming.

In order to avoid all trouble of this kind and to insure good washing and classification and washing as well as de-watering, it is best to employ some good form of automatic settling tank. There are a number of these on the market from which a choice may be made, and while there is a prejudice against them in some quarters this is generally because they are improperly installed or else that they are not kept in good working condition. The failure to renew the knife edges in one well-known type has sometimes caused it to be condemned, although the expenditure of very little time and money would have turned it into a satisfactory machine.

Improving the Settling Method

A plant employing one form of these automatic sand tanks is shown in Fig. 3. The tanks are in the little house which is set on top of the steel framework. They are set high to provide a storage space underneath, to which the sand flows by gravity. The long steel troughs which carry the discharge are shown in the illustration in the position for filling cars, but these launders may be swung around into any position, and gates at various points in the bottom of the launders permit the sand to run out at any point above the stock pile.

The stock pile serves to store the sand, but it also drains it so that it can be loaded into trucks by means of an ordinary wagon loader. At this particular plant there is a good trucking trade which will take care of all the sand that is put into stock, but in plants from which all the sand is loaded into cars it would be necessary to install some appropriate method of loading from the pile.

An especial feature of this plant is the use of extra water to give the sand a second wash. This water is applied as "hydraulic water." The use of water in this way will be described in a future article. The tank for containing this water may be seen at the top of the plant.

In designing this plant there has been no effort to keep down the head against which the pump must work—in fact, the head has been deliberately raised about 40 ft. to provide room under the tanks for storage.

The question will at once arise: Is this an economical method of getting sand into storage? In the writer's opinion there is no doubt about its economy. Once the sand is in the pipe and in motion, the cheapest way to get it to a higher level is to pump it to that level, always provided that the pump is designed to work against the higher head. There are limits, of course, to which the pumping may be economically carried, but even in cases in which the cost might be a little higher, it would seem better to pump with the same machine rather than to go to the expense of installing the equipment for mechanical handling. The decision as to a change of method would seem to come at the place where a booster or relay pump had to be installed.

Modern engineering practice is beginning to appreciate the ease and economy of moving finely divided solids in a stream of water. The improvements in centrifugal pumps, especially in the use of manganese steel for the parts subjected to the greatest wear, have been largely responsible for this.

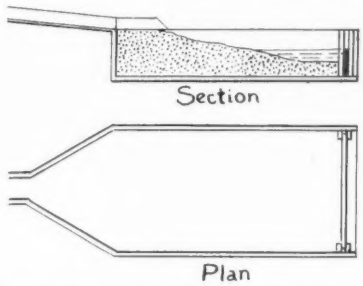


Fig. 5—An improvement on the cistern. A tank which takes little head room and which is a good classifier

In the plant just described there is one thing lacking—a method of absorbing the variations in the feed. This is not surprising, because it is not usual to provide such a method; it is a point, however, that ought to be looked after in building any plant to be fed by a centrifugal pump.

The discharge from a dredge pump is constantly changing in respect to the amount of solids pumped. At one time the pump will throw only water, and this is so much lighter than the average mixture of sand and water which the pump is supposed to handle that it will throw it out at a high velocity and in great quantity. At another time so much sand will be pumped that the mixture is very heavy and the pump cannot do much more than to lift it to the discharge end of the pipe.

Under such conditions no sort of sand-recovery device can do its best work. For all these are given a definite settling area and designed to handle a definite amount of water, so with great variations in the feed, the best that they can give is an average between good work and poor work. This applies to all machines of the sort, not only automatic settling tanks but those which employ mechanical excavators and even the simple settling box.

This difficulty may be overcome by putting in what the writer calls a "surge tank," to absorb the variations in both the solids and the water in the feed. The arrangement is shown in Fig. 4. The surge tank is provided with an overflow which carries away the excess water, and a "gooseneck" discharge delivers the sand with what water will accompany it to the settling tank. Under such conditions the quantity of feed will be almost constant—that is, as measured in cubic feet or gallons per minute. There will still be some variations in the quantity of solids, but not such a variation as there would be if the surge tank was not used.

There is no novelty in this arrangement, as the device has been used in other lines

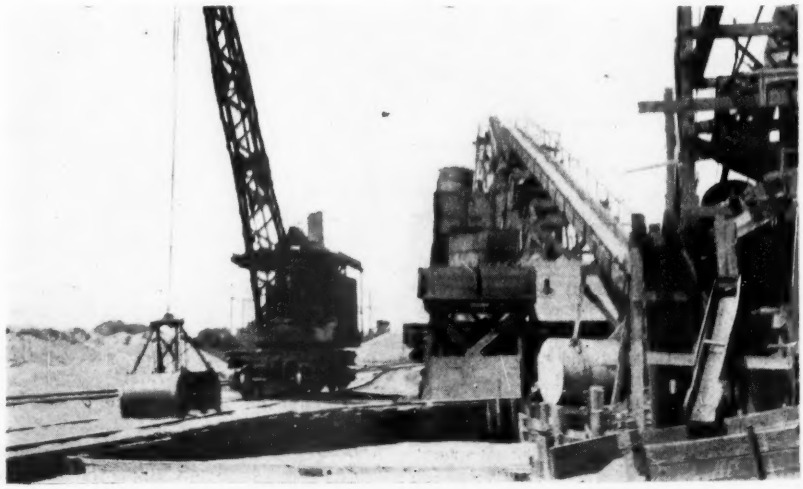


Fig. 6—Flat tank and locomotive crane for unloading

of industry for a long time, but it does not seem to be in use in the sand and gravel industry to any extent.

Flat Tank Better Than Cistern

Turning now to the second form of sand plant, in which every effort is made to keep the head against which the pump must work as low as possible, it would seem that several improvements might be made in the plant as shown. In the first

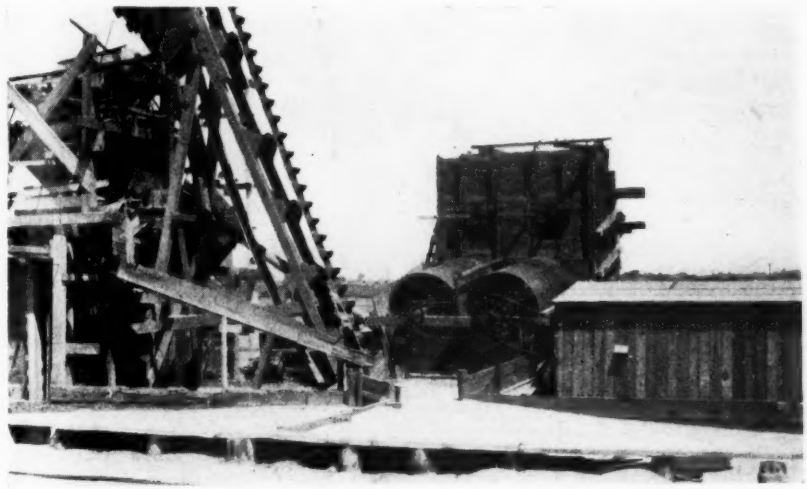


Fig. 7—Showing how two flat tanks are arranged to be filled alternately

place, the settling pool, or cistern, has all the defects of the settling box which has just been discussed, and like it, is neither a good washing device nor a good classifier. In the second place, there is too much depending on the locomotive crane, which has to handle a great part of the product twice.

This second condition might be improved by using one of the sand-recovery devices which dig out the settled sand by means of some sort of conveyor. By making this conveyor long enough and high enough it could be used to build a stock pile as well as to recover the sand from the settling box. That this is a practical idea is proven by the great piles of "chats" (crushed and treated ore from the zinc mills) to be found in the country around Joplin, Mo., all of which were built in the way described.

If it is really necessary to keep the head as low as possible, there are better sand recovery devices than the cistern shown in Fig. 2. One of these is illustrated in Fig. 5. This is a flat tank (the old writers on metallurgy called it a "buddle"). It is an excellent washer and classifier, but it needs pretty constant attendance.

As shown in the diagram, it is a long and broad box, with an apron at the feed end to spread out the feed. The discharge end is fitted with a slat gate, made up of "two-by-fours," as a general rule. These sticks are put in one at a time as the sand raises.

The operation is as follows: The tank being empty, the water flows in a thin stream along the tank bottom, and being spread out so thin it cannot carry away the larger pieces, which stay on the bottom and form a bed. This bed is a good medium for catching and holding sand, but it allows the clay and fine trash to be swept over it by the flow of the water. As the sand is built up the gate is raised by putting in the sticks; the gate, however, is built only high enough to prevent the sand which has settled from being washed away. Usually a depth of from 2 to 3 in. is maintained at the gate. The sand at the feed end of the tank is always out of water.

When the sand has been built up as high as the tank will hold it, the water is shut off and another tank of the same kind is filled. While this second tank is filling, the first tank is emptied by the locomotive crane and loaded either to cars or to a stock pile.

It is much better to put it in the stock pile before putting it into the cars, as the sand will be mixed in this way. One of the defects of this device is that the coarse sand settles first, so that the filled tank shows a graded sand, very coarse at the feed end and very fine at the end nearest the slat gate. This may be an advantage in those cases where it is desired to separate the sand into two grades, as it is easy to do this while the tank is being unloaded.

In Figs. 6 and 7 are shown views of a sand settling tank such as has been described. These are not in a straight sand but in a sand and gravel plant, but the work is the same. In the illustration showing the revolving screens in the center are the two tanks filled with sand, the beds of sand sloping away from each other. The view was taken while the plant was not running; under ordinary running conditions one of the tanks would be filling while the other was being emptied. The other illustration shows the lower end of one of the tanks and the locomotive crane in position to discharge it and put it on the stockpile.

(To be continued)

Missouri Portland Cement Co. Changing to Wet Process

THE Missouri Portland Cement Co.'s plant at Prospect Hill, Mo., is being converted from the dry to the wet process. F. L. Smidth & Co., New York, are the engineers making the changes. It is expected that the work will be completed within the next few months.

Two kilns, 240 ft. long and 11 ft. 3 in. in diameter in the burning zone, and 10 ft. in diameter beyond the burning zone, are being installed. These kilns will replace three 7½x125-ft. kilns of the same type. One of

One of the concrete stacks for the wet process. The insert shows the stock base and the excavation work preliminary to laying of foundations

the two huge reinforced concrete smokestacks has been completed and the construction of the second started. The insert in the illustration shows the proportions of the lower sections of these stacks.

The output under the wet process will be approximately 5000 bbl. per day, or 1400 bbl. more than the present output.

Storing and Shipping of Cement

By V. E. Forrest
Bland Engineering Co.

AMONG the cement mills, the storage and shipping of their product was not given much attention during the early days of the industry. Their output was small and was run into a single bin, then packed into barrels or bags by hand, the packages being weighed on portable scales. As the industry developed, the bins were made larger or additional bins built, arranged along aisles. Some mills introduced portable sacking elevators which were placed in the bins and moved forward as the cement was packed. The cement was shoveled into the boots of the elevators which filled the bags which were then weighed by hand, tied and trucked to the cars. Other mills installed conveyors in the floor of the bins to move the cement to a pack room where it was packed by hand.

During later years packing machinery has developed to a high state of efficiency. At first, the packing machinery was patterned after that used in flour mills but it was found that cement was not like flour. Flour is quite compressible and requires forcible packing while cement requires simply the release of the air entrapped within the mass, and for this reason specially constructed cement packers had to be devised; the final development being a machine which fills the bags through one corner after tying, and which automatically weighs the proper amount of cement into the bags.

While the packing machines have been developed, very little has been done in the way of developing proper storage buildings, pack houses and facilities for the care of returned bags.

About all that was provided was some bins with conveyors at the top and bottom. At first the bins were constructed of wood, later of reinforced concrete. Considerable finished cement—in fact, the very finest of the flour—was lost by dusting out through the walls, windows, etc., and the burning of a wooden stock house was a common occurrence owing to the heat generated in grinding the cement.

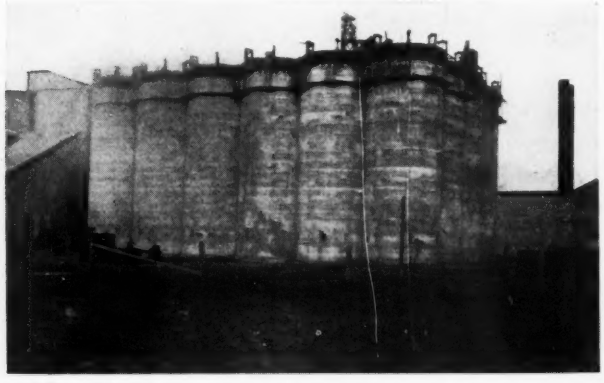
Most of the cement mills, especially in the eastern territory, are rebuilt mills; that is, they have grown up from the earlier days and have been improved and reconstructed. In rebuilding a mill, it is impossible to secure all the advantages of arrangement that can be had when designing an entirely new mill. Railway tracks are already located, quarries opened, some portions of the old mill are to be retained, and property is limited.

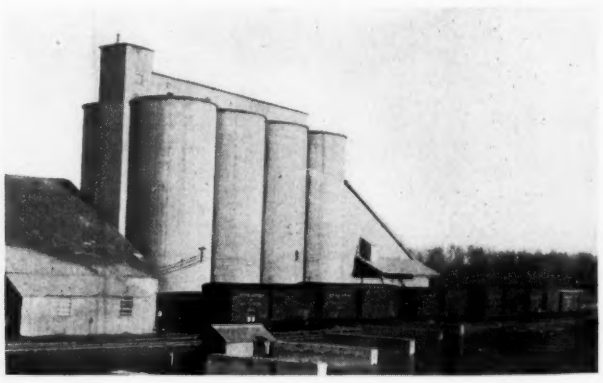
All these conditions have made it difficult to obtain the most satisfactory stock house, because attention was centered wholly upon the manufacturing of cement—storing and shipping not being considered until the mill was completed. Then a stock house was built. It was not designed—it was just built. Over at one side of the plant next to the railway tracks was room for a stock house. Very little thought was given to switching cars or to storage tracks for empty and loaded cars and no thought at all to the handling of the bags. The only engineering that was done was that of designing the walls and foundations, and it is evident from the number of stock house failures that many of them were not designed at all.

Within the past few years there has been a tendency toward treating the stock house as a part of the manufacturing process and to design it to secure the best results at the lowest cost. It is surprising to learn that this tendency began among the western mills and not among the eastern mills where the process of manufacture has been developed.

Eastern mills have cut the cost to the minimum from the quarry to the finished cement; the Western mills have carried the economy all the way and continue the saving on through the stock house and pack house to the cars, their idea being that a penny is a penny whether saved in the cost of manufacture or in the cost of shipping,

FIT the building to the operations instead of trying to fit the operations into the building. This applies to the stock, pack, and bag houses of a cement plant as well as to any other industrial structure. To accomplish this means the careful designing of the buildings with an eye to location, convenience, economy of operation, loading tracks, car storage facilities, and other features as well as to the members of the building itself. The author explains what to watch for in planning these buildings.





TWO GOOD STOCK HOUSES

At the left, storage is provided in 24 circular bins, with 15 intermediate or interstice bins. The stock house at the right is a well-planned one at an Iowa cement mill

and a penny saved at both places is two.

By using deep bins, it is found that shorter conveyors are required, thus effecting a saving in power as it is much cheaper to elevate than it is to convey. It is also found that less roof is required to be kept in repair, and as the bins are smaller in area it is not necessary for men to enter them except to clean out the very last cement in the bottom. The cement is placed in the bins by distributing conveyors at the top, which are oiled and looked after by the finish mill force; it is removed by conveyors at the bottom, which are cared for by the pack-house crew, thus eliminating all labor in the department of storage. Compare this method to the usual practice in the Lehigh Valley where they use large shallow bins and remove the cement to the conveyors in the aisles by power scrapers, or, in many cases, with hand hoes. Some of these mills estimate the cost of removing cement from storage to be about the same as the cost of packing and loading into cars.

The conveyor box of this distributing conveyor is built of concrete with steel spouts to bins. The photograph was taken during operation and shows dustless operation

The most economical type of storage seems to consist of circular reinforced concrete bins 75 to 80 ft. deep and from 15 to 40 in. diameter, depending upon the number of bins required. The spaces between the bins are also used for storage. If the bins are founded upon earth, the height will be governed by the loading the earth will stand, but when founded upon rock or piling they should be as high as one can safely construct elevators for handling the cement.

The entire structure should be built of reinforced concrete, including roofs which must be made waterproof with suitable coverings. Beneath the bins are tunnels containing the reclaiming conveyors and above the bins a gallery to house the distributing conveyors. The elevators and distributing conveyors should be proportioned to easily carry the maximum capacity of the finish mill and should be installed in duplicate so that there will be no delays while making repairs. Elevators should be designed with a view to their great height and subject to frequent rigid inspections to prevent failures. By anticipating failures of worn parts, failures can be entirely avoided.

Distributing conveyors should be provided with signaling devices which give unmistakable warning to the finish mill operators in case the conveyors do not operate properly. At the warning signal the feed can be shut off before the elevators choke, and thus avoid wrecking the elevators. The starters for the motors which drive the elevators and distributing conveyors should be placed in the finish mill.

Reclaiming conveyors in the tunnels should be proportioned by the maximum capacity of the pack house and should be driven by motors at the delivery end with the starters located close by. Steel spouts with gates regulate the flow from the bins to the conveyors. No provision is necessary for flooding as it is well known that cement floods only when mixed with air and this cannot happen until the bin is nearly empty. The reclaiming conveyors discharge into collecting conveyors, which should be installed in duplicate and which in turn discharge into the pack-house elevators. The pack-house elevators, which should be in duplicate, discharge into conveyors which distribute the cement to the packing bins and at the same time remove tramp iron.

The pack house and the bag house should be considered as a part of the stock house system and given proper study as an engineering problem. The lay-out should be such that cars can be switched without interfering with shipping and there should be sufficient car storage to provide cars until the next switch time. That is, if switching is done once a day there should be car storage tracks for both empty and loaded cars for a full day's packing and loading. Tracks should be arranged, if possible, so that it will not be necessary to truck through cars to cars upon the second track, and should be inclined in the direction the loaded cars are moved to facilitate disposing of loaded cars. A car puller capable of handling several loaded cars should be installed, then it will not be necessary to stop the entire packing crew and have them all get out to help push a car. Loading platforms should be very narrow or dispensed with entirely, the idea being that the wider the platform, the further it is necessary to convey the loaded bags to the car.

The pack house should be carefully planned and should be large enough to care for the peak loads in packing. Packing and shipping are highly seasonable and are different from manufacturing. The mill can be operated steadily, getting ahead a surplus during the days of light shipments to care for the peak loads, but it is not possible to load up a long string of cars and have them ready to ship upon a moment's notice. Therefore it is necessary to have a packing plant large enough to care for rushes. Certain periods of the year require heavier shipments than others and during the heaviest shipping periods weather conditions will interfere so that the shipments will be light for a few days, only to be followed by a few days of extra rush shipments. This is the peak load that the pack house must be designed to handle. Ordinarily, packing is hard, dirty, dusty, hot work and the highest speed is required during the hottest months. Most pack houses are built without regard to ventilation or comfort and, consequently, it is difficult to keep a packing crew on the job, especially during the hot weather when shipments are the heaviest. For this reason the pack house should not be located between buildings where the sun beats down upon it and where there is not a breath of air to be had, but should be located where it is exposed on three sides and gets the benefit of light and breezes. It should have plenty of large windows to let in the air and light and in many cases ventilating fans should be installed. It is preferable to have the packing machines located above the height of the cars so that the packers will have the benefit of the light and air, and the bags chuted to the cars instead of carried upon belts. Machinery should be built as nearly dust proof as possible; packing bins should be covered on top; and the spill from the machines should drop into bins which discharge into return conveyors. A pack house constructed along these lines will be clean and no more dusty than some other portions of the mill. Thus it will be a more desirable place in which to work.

The bag house should also claim its share of attention from the engineer. It should be located so that bags can be delivered to it both from cars and from trucks without interfering with packing and shipping. It should be so arranged that the bags will be cleaned, repaired, tied, stored, and delivered to the packers with the least possible expense and should be clean, light, and well ventilated. The bags should be delivered to the packers without interference with their work and it should not be necessary to carry bundles of bags by hand. In the ideal bag house, the bags should be taken through a regular and well-planned cycle of operations, moving always forward toward the pack house. This may be done in a single-story building, in which case it is necessary to load them upon trucks or push cars between operations, or it may be done in a vertically arranged plant in which each operation is confined to one story of the building and the bags handled by gravity

from one department to the next, finally being chuted from bag storage to the packing machines. In designing a bag house, careful study should be made of the time and space required for each operation and allowances made for expansion, then it should be a simple matter to design a building to fit the operations. Making the building to fit the operations is much different from the ordinary practice of trying to fit the operations to the building. Bags should be routed logically; received, cleaned, sorted, repaired, tied, and then stored. These operations should take place in a proper bag house and not in various sheds and corners in the pack houses.

Preventing Waste of Rock

All the way through a cement mill, extreme caution is taken to prevent waste. Even in the quarry, great care is taken to prevent waste of rock. At this point the material is the cheapest of any place during the process of manufacture. In the raw mill care is taken to prevent waste, clinker is carefully taken care of to prevent loss, and in the finish mill utmost caution is taken to prevent waste, but when the process of manufacture is completed, the cement finished and the greatest amount of money invested in it, the care ceases and we find the finest of the cement blowing out of the windows, men wading around in cement in the pack house—even the shipping tracks covered with expensive cement. A cement mill manager or superintendent would "holler his head off" if he found a wagon load of raw mix on the floor of the raw mill, but he will gaily trip through finished cement up to his ankles when he passes through the pack house and blithely tell a visitor that the pack house is a "hell of a place to get men to work in."

Stone is cheap, raw mix is cheap, still they are carefully guarded; finished cement is mighty expensive and should be guarded also. It can be saved, too, if the stock house and pack house are properly designed.

Kansas City to Have New Crushing Plant

TWO tracts of land of 113 acres have been purchased by W. M. Spencer of Independence, Mo., for the development of a crushed stone quarry. It cost $75,000.

The land is at Alton Junction, south of the Big Blue river and near the east limits of Kansas City. The tracts are divided by the Kansas City Southern, Chicago & Alton, Missouri Pacific, Atchison, Topeka & Santa Fe and the Kansas City Terminal railroad tracks.

One of the tracts, representing 46 acres, is estimated to contain a deposit of 5,000,000 tons of limestone. This deposit is covered with an overburden of 40 ft., a total of 2,000,000 cu. yd. of dirt. It is the present plan to remove all of the dirt before starting the quarry operation. This will be accomplished by hydraulic pressure with a pump delivering 2,000 gal. of water per minute, the dirt being washed through open flumes under the railroad tracks to the lowlands of the other tract. In this way the 67-acre tract will be filled to a point where it can be used as terminal railroad yards.

A canal will be built running south from the quarry to the river. After the dirt has been removed, barges will be built to carry the crushed stone from the plant to the river for shipment.

Mr. Spencer states that it will take five years to remove the dirt and fill in the bottom tract, and that it will take 10 years to quarry the stone. A crushing plant with an average daily capacity of 2,000 tons is to be erected. The plant will have direct connections with all the railroads mentioned and will be in a position to serve a territory within a 250-mile radius of Kansas City.

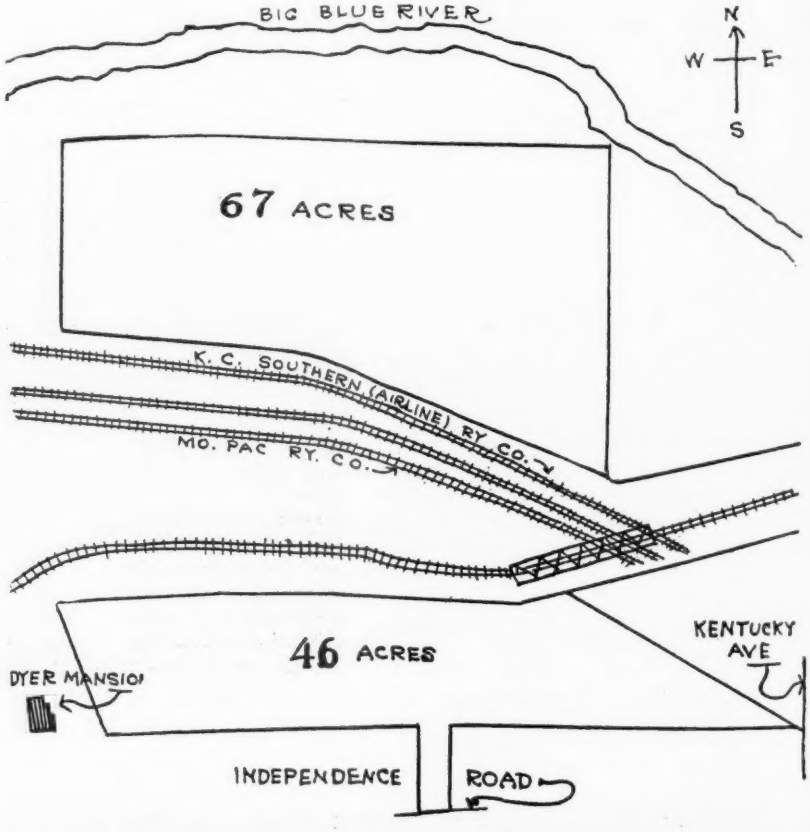
Linwood Stone Co. Increases Stock to $2,000,000

THE Linwood Stone and Cement Co., of Davenport, Ia., has filed amended articles of incorporation increasing its capitalization from $300,000 to $2,000,000. The amendment calls for the issuance of $1,000,000 in common stock and $1,000,000 in preferred; both common and preferred have a value of $50 per share.

The company's plant is at Linwood, Scott county, Ia. The new capital will be used for expansion, including the purchase of more land and remodeling the plant. The personnel is as follows: A. E. Horst, president; A. E. Carroll, first vice-president; C. C. Hagerman, second vice-president; Otto Hill, treasurer; and J. F. Schroeder, secretary and general manager. These men, together with Dr. F. Neufeld, R. J. Walsh, A. C. Klindt and E. R. Schroeder, constitute the board of directors.

Coal Distribution Control Until January 1

FEDERAL control of coal distribution must be continued until Jan. 1, President Harding decided on November 24. C. S. Spens, federal fuel distributor, called on the president on that date to resign his office, but after discussing the situation agreed to remain in service until January 1 and to continue in effect the present supervision or a modification of it until the first of the year.



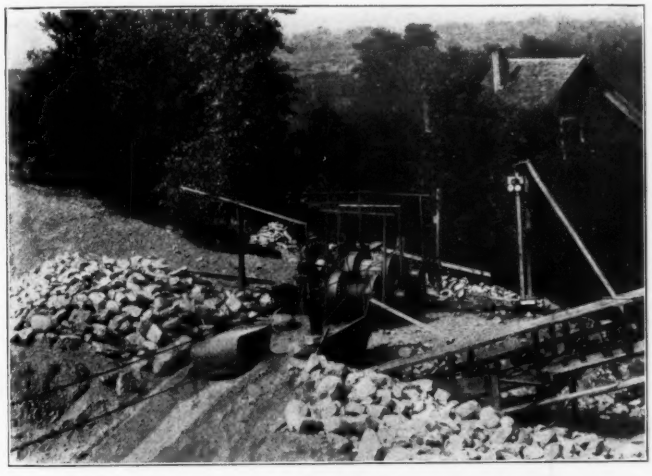
Map showing the Kansas City land purchased by Mr. Spencer. Here he will erect a crushing plant of 2000-tons daily capacity

Interesting Hillside Operation

The adaptability of the dragline bucket-excavator system of sand and gravel operation to a side-hill deposit is shown at this Minnesota plant

SAND and gravel or limestone plants located on hillsides have a decided advantage over those on a level in that they are favored by a natural factor—gravity.

At gravity operations the material coming from the quarry or pit can be put through the different processes in the plant with a minimum of conveying and elevating. In this way the operating costs are reduced to a minimum, thus leaving a larger margin of profit. In addition to the operating costs, the original cost of the plant and its equipment is comparatively lower than that of one not so advantageously located.



The electric hoist, scraper-bucket, hopper and conveyor. Oversize boulders are removed by hand from the grizzly

The plant of the Conroy & Clewett Co., at Inner Grove, Minn., is typical of a model hillside sand and gravel operation. The plant at this operation can justly be called a gravity plant, because, with but one exception, the material is handled by gravity in all the processes it passes through.

Excavating is accomplished by a 1-yd. scraper bucket pulled by a two-drum American electric hoist powered by a 37-hp. motor. The hoist is located approximately 200 ft. from the pit and 5 ft. back of the hopper. Heavy bumper posts have been placed directly in front of the hoist to stop the scraper should it be accidentally dragged past the hopper.

The receiving hopper is fitted with a crossbar type grizzly and oversize boulders are removed by hand. The hopper feeds the material to an 18-in. conveyor belt 200 ft. long, which is inclined to the screen plant. This conveyor is driven by a 15-hp. motor.

The plant is a dry-screen operation and is equipped with four sets of Cyclone-Roth vibrating screens which size the material from 1 in. down to a fine grade of sand. The elevation of the material from the receiving hopper to the plant is the only elevation necessary in the entire operation. The sand and gravel pass through the screens by gravity and continue through the sizing operation and into storage bins without being elevated or conveyed.

General view of the entire operation. Note the elevation of the conveyor to the plant

Considering that with this small amount of equipment the plant has a daily output of 600 yd. of sand and gravel, the merits of a hillside operation are apparent. A hoisting unit, a conveyor to move the material to the plant, and a screening unit—all powered by but two motors having a total of 52 hp.—comprise the equipment necessary for this company to produce 600 yd. of marketable product.

Excellent highways make it practicable to make the greater part of the deliveries by motor truck. As the railroad is several hundred yards from the plant the company loads its material to be shipped by rail into motor trucks which carry it direct into railroad cars. To facilitate the loading of railroad cars by truck, the company has constructed a loading platform of clay in a cribwork of old ties.

The Conway & Clewett operation is an excellent example of an economically yet adequately equipped plant. While it is not possible for all plants to be located on hillsides, it is possible for a great majority of plant operators to make gravity do a large amount of work. In many cases the use of a bucket elevator or inclined conveyor may be employed to elevate the material to overhead bins, thus virtually creating a "hillside plant."

Charles Warner Active in Creating Business

HOW citizens of Wilmington and the state of Delaware are being educated to see the value and necessity of a systematic method of saving, is due to the foresight, combined with the power to put ideas into practice, of a small group of citizens who have been led by one of Wilmington's active business men, Charles Warner. Mr. Warner is president of the Charles Warner Co. and of the American Lime and Stone Co., which associated companies constitute one of the largest producing groups of lime products and kindred materials in the East. The progress that Charles Warner has made in his private business is being repeated in the way the thrift movement is being inaugurated through building and loan associations.

On January 1 there were 23,570 shares of building and loan stock outstanding in all the associations in Delaware. The per capita of stock held was $17.65, one of the lowest of any state. The country was in process of rehabilitation after the war and engaging in preparations for an intensive business reconstruction. The housing shortage was acute and the lack of money available for mortgages tended to discourage the construction of new residences.

How building construction was stimulated and the number of shares of building and loan stock increased from the 23,570 shares to 40,000 through a building and loan campaign, and the money available for investment in homes added to by $130,000 per annum and which is growing monthly—all indicate how well the plans of Mr. Warner and his colleagues in booming thrift in Delaware have succeeded.

A conference of prominent business men was called and the situation discussed. Mr. Warner suggested that a broad plan be adopted for arousing general interest in associations, and from this suggestion was evolved the Building and Loan Information Bureau, with Mr. Warner as president. The purpose of this bureau was not alone to start new building organizations safely, and establish them on a sound basis with strong men on their directory, but also to stimulate citizens broadly to use both the old and new associations, whichever was most convenient.

A monthly budget of $400 was raised for expenses, contributed by public-spirited Wilmington business men. As a result of the activities, nine new loan associations were organized in and around Wilmington and 11,671 new shares were sold. The old associations also profited from the stimulus given savings by this method. One of the old associations sold 1500 shares on the beginning of a new series, whereas, it had never before disposed of more than 600. One of the new associations loaned $35,000 on real estate mortgages in the first seven months, and the desire to save through building and loan associations is spreading in Delaware like a contagion.

The next problem was how to handle

Charles Warner

the building and loan plan as a state movement. In answer to this Mr. Warner and his associates evolved the "Delaware State League of Building and Loan Associations." At a meeting called in Wilmington 31 of 33 loan associations of the state were represented and joined the state league. This league is planning to extend its activities to every town in Delaware where there are sufficient inhabitants to warrant. Mr. Warner was elected president of the state league and was made its representative in the National Association of Building and Loan Associations.

The state league plans to exercise the same suggestive functions that the state bankers' association exercises, providing the necessary stimulus and co-operation for all new loan associations. "Systematic Saving" is its slogan.

In order to arouse enthusiasm throughout Delaware, the State League of Building and Loan Associations has set aside the week of January 18 as Thrift Week. Governor William D. Denny, who is only too willing to co-operate with all progressive measures that will add to the credit of the commonwealth, has agreed to naming it Thrift Week in an official proclamation.

The state league will hold a building and loan convention in Wilmington on Monday, January 8, so that the seven thrift days may have a suitable inauguration. During that week the board of directors of every loan association in the state will seek to interest new shareholders.

Back of this movement is the guiding spirit of Charles Warner, one of the hardest working men in Delaware. Although his duties are arduous as president of his two companies, as president of the National Lime Association, and a member of the Board of Harbor Commissioners of Wilmington (which is just completing a $3,000,000 marine terminal), he has found time to devote to a cause which will be one of immeasurable benefit to Wilmington and Delaware.

I. C. C. Suspends Fargo Rate Increase

AS THE result of a protest filed by the traffic department of the Fargo Commercial Club, the Interstate Commerce Commission has suspended until February 16 the Great Northern's proposed raise in sand and gravel rates from Barnesville, Minn., Downer and Downer pit to Fargo, says the *Improvement Bulletin.*

The protest against the proposed raise is based on principle rather than amount, and is expected to have an important bearing on the Fargo sand and gravel case, now pending before the commission and which case was set for hearing at the same time as the important Fargo rate case, December 4. The Great Northern's present rate on sand and gravel from Barnesville, Downer and the Downer pit is 3½ cents per hundred and the proposed raise is 4 cents per hundred.

Fargo contractors made the request for the suspension, holding an additional raise in these rates unfair in view of the present situation, the present rate on these building commodities to Moorhead from Barnesville and Downer being 3 cents per hundred. All sand and gravel for Moorhead is first hauled to Fargo and weighed, then hauled back to Moorhead. The Moorhead rate is fixed by the Minnesota state scale, which does not apply to North Dakota points.

The Great Northern proposed the increase in order to equalize its rate with the present rate on the Northern Pacific from Muskoda to Fargo, which is 4 cents. The Northern Pacific also hauls all gravel destined to Moorhead, to Fargo to be weighed, and then hauls it back for 1 cent per hundred under the Fargo rate.

Production Costs of Rock Products

By Oliver Bowles

No. 3—Here Mr. Bowles presents a specific problem in costs, including items which make up quarry costs, loading methods employed, steam-shovel loading, track arrangement, and comparisons of output and cost

IN ROCK PRODUCTS of October 21 some of the advantages resulting from low production costs were pointed out, and in the issue of November 4, methods of reducing costs were considered in a general way. In this, the third article, consideration will be given to specific cost problems in one of the most important branches of quarry work, that of rock loading.

Items Which Make Up Quarry Cost

The various items that constitute total quarry cost vary greatly in different localities. All quarry operators must realize the difficulty of giving general figures where conditions are so extremely variable. Nevertheless, some attempts have been made to arrive at averages, and the results are worthy of consideration.

Several years ago, in connection with a large enterprise in the South, a careful estimate was made of the itemized cost of quarrying limestone on a large scale under average conditions. The figures applied only to operations up to the point where the rock was loaded on quarry cars. The cost figures, changed so as to conform with conditions of today, are:

Estimated Average Costs for a Large, Well-Equipped Limestone Quarry Per Ton of Rock Produced

	Cents
Stripping	2.5
Drilling	8.5
Explosives	5.5
Rock Loading	14.0
Repairs, Taxes, etc.	2.5
Interest and Amortization	3.5
Loss of Fire Materials	3.5
Total Cost per Ton	40.0

It may be of interest to note that the figures for drilling and explosives, given in the table, agree almost exactly with those given for a blast in a quarry at Nazareth, Pa., as described in ROCK PRODUCTS of February 25, 1922, page 17. These figures are presented with some degree of hesitancy, for it is realized that there is room for considerable difference of opinion.

Assuming that the figures are approximately correct, it is interesting to note that rock loading is the chief single item of cost. Consequently, in any attempt to reduce costs, special consideration should be given to this important process.

Two Loading Methods Employed

Two greatly diverse methods of loading rock are in common use: the hand method and the steam shovel. Each method may be used by equally progressive companies—in fact, both methods are at times employed in different parts of the same quarry. It is evident, therefore, that neither method may be unceremoniously condemned in favor of the other, and it may be profitable to consider the conditions under which each method is most economical.

Hand loading in large quarries may be fully justified where it takes the place of costly equipment. Thus, in one large fluxing limestone quarry, from 2000 to 2500 tons of rock, on an average, are loaded by hand every day. The rock is dumped into railroad cars and hauled to iron furnaces. No crushing, screening, washing or grinding equipment is required, for the rock fragments, of "one-man" size down to 4 or 5 in., are in just the form desired. If steam shovels were used a crushing and screening equipment would also be necessary; thus hand loading takes the place of a series of costly machines. Conditions are similar at many lime plants, for here again the rock is used in sizes approximately the same as fluxing stone, and hand loading supplants a full equipment of steam shovels, crushers and screens. At certain cement plants the rock is also loaded by hand, but here the conditions are different, for the raw material must be ground to a powder before it is manufactured into cement.

Track arrangement for hand loading in a large quarry

Use of Hand Loading

Generally speaking, loading in small quarries may be done at lower cost by hand methods, while the steam shovel is most advantageous for a large output. There are many large quarries, however, where hand loading is pursued with advantage, while in other places a production of not more than 150 to 300 tons per day may be handled profitably with a steam shovel.

What, then, are the factors that must be taken into account in judging the method that is best to use?

No matter what method of loading is used, a crushing and grinding plant is re-

quired, and therefore, on the basis of equipment, hand loading is less advantageous, for it replaces the steam shovel only.

Hand loading also permits sorting of the rock and the rejection of all defective pieces. Thus, in quarries where impurities occur irregularly throughout the rock mass, a pure product will usually result if careful hand selection of stone is followed.

Advantage of Steam Shovel Loading

One great advantage of the steam shovel is its ability to load blocks of considerable size, hence blasting costs are relatively lower than for hand loading, and little or no hand sledging is necessary. Its ability to handle a great volume of rock with few men is an advantage at times, when labor is scarce and wages are high. At times, the decision to use a steam shovel is influenced by labor problems rather than by actual economy in costs.

There are also certain disadvantages in its use, the chief of which is its inability to sort the rock either according to size or quality. Thus it is usually necessary to add crushing and screening equipment where such equipment is unnecessary with hand loading. This is particularly true of quarries providing stone for fluxing and lime manufacture, where the hand-loaded rock is in exactly the proper form for use. The steam shovel, together with crushers and screens, is a costly equipment that may be justified only where a large output of rock is desired, and where the necessary capital is readily available. There are numerous quarries, however, where the addition of a small steam shovel may be a decided advantage if it necessitates no radical change in following equipment.

Track Arrangement an Important Factor

An important factor in keeping down the cost by either loading method is the convenience of track arrangement. For steam-shovel loading at a wide face a track parallel to the face permits cars to be loaded in succession and moved along until a trainload is obtained. A convenient method at a narrow face is to have two tracks running directly toward the face, and both within reach of the shovel, for this permits spotting an empty on one track while loading on the other, and loading on alternate tracks therefore saves much loss of time. Where only one car track is provided the shovel must remain idle while the loaded car or groups of cars is moved away and the empties are returned.

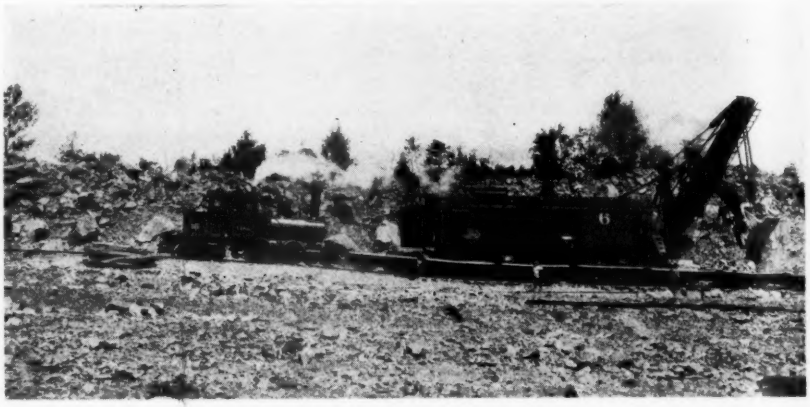
For hand loading it is advisable to have independent trackage from the main line to each loading place, so that loaders are not delayed by obstruction to the necessary movement of loaded or empty cars.

Comparison of Output

The steam shovel is usually employed to save labor, for the tonnage of rock per man is much higher than where hand loading is followed. The usual steam-shovel gang consists of one runner, one cranesman, one fireman, and three to six pitmen. Some of the smaller types of shovels require no cranesman. The amount of material handled by a steam shovel varies greatly, but in general it may be stated that the smaller tractor types will load from 250 to 400 tons per day, while the larger ones, with 3 to 4-yd. dippers, may attain a maximum of from 1400 to 1700 tons per day. The number of tons of rock loaded with a steam shovel per man per day has been determined at various quarries. Reliable figures obtained a few years ago indicate that for 14 quarries in limestone or cement rock the average, for shovel men and pit men only, was 112 tons per man, whereas at 11 quarries where hand loading was employed, the daily tonnage per man, loading only, was 16. Thus on an average, seven times as much rock per man were loaded by mechanical as by hand methods.

The question is commonly raised regarding what output may be expected from a given number of men in a quarry by either of the two loading methods. These average figures are interesting:

In 12 limestone and cement rock quarries employing steam shovels, the tonnage per man per day, including the men employed in all operations, from stripping until the rock was taken to the crusher, varied from 27 to 75, with an average of 45. For 10 quarries using hand-loading methods, the output varied from 8 to 20 tons, with an average of 12.5 tons per man per day. Thus, under average conditions, a quarry employing 35 men may expect to produce about 1500 tons of limestone per day if steam shovels are used, and about 425 tons per day by the hand-loading methods.



Typical steam-shovel loading in a large quarry

A Comparison of Costs

The cost of hand loading is easy to determine for it is usually done on a contract basis. In 1922 it varied from 18 to 23 cents per ton. The cost of steam-shovel loading is much more complex, for various factors enter the problem. A hand-loading cost includes sledging which, in a measure at least, takes the place of crushing; also, in hand loading, the dirt and fines may be separated, a process which may take the place of screening.

A series of factors such as labor, fuel, maintenance, interest on investment, repairs, and even a part of the crushing and screening expense, must be considered in determining the cost of steam-shovel loading as compared with hand loading. So little published data are available that it is difficult to arrive at even an approximation of the cost of steam-shovel loading in rock quarries. It is probable that for large, open-pit quarries, under favorable conditions, for mechanical operation, the steam-shovel cost is considerably the lower. For the average quarry a hasty decision regarding loading equipment is to be deplored. Careful consideration must be given to all the factors involved before a reliable conclusion may be reached as to the best means to employ.

SAND AND GRAVEL CONVENTION

THE seventh annual meeting of the National Association of Sand and Gravel Producers will be held at the Raleigh Hotel, Washington, D. C., January 24, 25 and 26. A real program has been arranged and will soon be made public. All members are urged to attend as this convention will afford some treats that only the Capital City can offer.

Will Build Largest Cement-Brick Plant

THE Pennsylvania Brick and Tile Co. of Philadelphia has recently acquired property at the foot of Westmoreland street and the Delaware river, on which it will erect what is said will be the largest cement-brick plant in the United States. Construction was started on December 11 under the supervision of Cloyd M. Chapman, consulting engineer of New York.

The plant will be built by the Cemprod Engineering and Construction Co. of New York, at a cost of $100,000. This figure does not include the cost of the wharves, sand supply, barge equipment and real estate. The latter was acquired at a cost of $50,000.

The plant proper will be of all-steel construction and modern in every respect. All materials will be handled by conveying, elevating, distributing, apportioning, mixing and pressing machinery, so that the manufacturing process will be continuous from the time the cement and sand are dumped into the receiving hopper until the finished product is produced.

The sand to be used will be dredged from the Delaware river and will be delivered to the plant alongside the dock. Land connection will be by the Belt Line railroad.

A feature of the manufacturing method to be employed is that the finished brick will be ready for shipment 48 hr. after its manufacture. This is made possible by the use of an accelerator, also known as a brick-flux. It is a chemical added to the water used in mixing concrete.

Only common building brick will be manufactured at first, but it is proposed to later make face brick and concrete tile for foundation walls that are to be plastered or stuccoed.

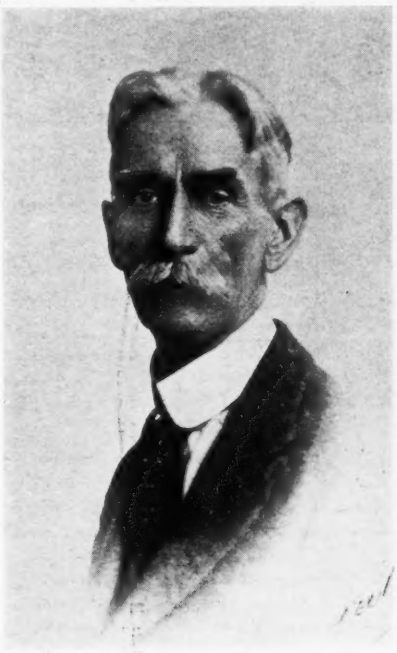
One of the principal problems in brick manufacturing is the distribution of the finished product. With common brick, plants must be located near the clay deposits, which involves the loading of cars or barges at the plant; transportation to the city in which they are to be used; unloading at the wholesaler's yard, and the distribution to the job. The result is that with this frequent handling, the percentage of breakage is increased. At this new plant the handling will be reduced to a minimum, due to its advantageous location. Company officials state that all of the output will be sold within a 10-mile radius of the plant and that all deliveries will be made by motor truck direct to the job.

At the present time the largest cement-brick plant in operation in this country is at Arbutus, Md., and is owned by the Adamantex Brick Co. of Maryland, Inc. This plant was opened last June and has maintained a daily output of 100,000 brick per day. In addition to this plant there are also two other large plants, one at Haverill, and another at Boston, Mass.

The new plant will be completed and in operation not later than March 1, and will have a capacity of 150,000 common brick per day.

Death of Dr. Spencer Baird Newberry

NEWS of the death of Dr. Spencer Baird Newberry, head of the Sandusky Cement Co. of Cleveland, and for many years an outstanding figure in the portland cement industry, has come as a great shock to his personal and business friends and to the trade in general. He



Spencer Baird Newberry

was stricken at the wheel of his car on Tuesday, November 28, while driving through the downtown district of Cleveland, on the way to his office.

Dr. Newberry was born in 1857, and for a number of years following his graduation from Cornell was professor of chemistry in that institution. In 1892 he founded the Sandusky Cement Co., with a mill at Bay Bridge, Ohio. Serving for a number of years as general manager, he was later elected president, which position he held until his death.

Under his management the business expanded both in volume and in production units. The original Bay Bridge plant was supplemented by others at York, Pa., Toledo, Ohio, Syracuse, Ind., and Dixon, Ill.

Of the many important contributions that Dr. Newberry has made to the development and advancement of the industry, perhaps the greatest was his discovery of a practical method of rendering concrete waterproof. He was also very instrumental in making white cement practicable from a commercial standpoint, and his firm was one of the earliest producers of waterproof cement.

Dr Newberry is survived by a widow and two sons, Andrew W. and Arthur C. It is announced that no changes in the personnel, management or policies of the Sandusky Cement Co. are to be made for the present.

Illinois Sand and Gravel Association Elects Officers

THE annual meeting of the Illinois Sand and Gravel Association was held at Springfield on Wednesday, December 6. The following officers were elected for the ensuing year:

M. D. Schaff, of the Springfield-Pekin Sand and Gravel Co., president; J. C. Sitterly, of the Western Sand and Gravel Co., vice-president; Ellwood Bienemann, of the Peoria Washed Sand and Gravel Co., secretary-treasurer.

T. E. McGrath, of the McGrath Sand and Gravel Co., and H. E. Neal, of the Neal Gravel Co., were elected directors. The officers and the two directors constitute the executive committee.

Following the association meeting, a meeting of the sixteenth district of the national association was held. Mr. Schaff, the president-elect of the Illinois association, was elected director of the national association for the coming year. Messrs. Schaff, Johnson and Sutton were named as delegates to represent the sixteenth district at the annual meeting of the national association, to be held at Washington, January 24, 25 and 26.

Canada's New Soapstone Company

ANNOUNCEMENT has been made of the organization, with a capital of $500,000 and with head offices at Toronto, of a company to mine soapstone in the Wabigoon district, about 200 miles northwest of Fort William. It is said to own one of the largest soapstone deposits known, which upon exploitation will not only supply the Canadian demand but provide a surplus for export. The development will interest the pulp and paper companies which use this stone.—*Commerce Reports.*

McGrath Co. Increases Capital to $500,000

IT HAS been announced that the McGrath Sand and Gravel Co. of Lincoln, Ill., has increased its capitalization from $100,000 to $500,000, and that the company intends building an additional plant at Joliet, Ill. With this new plant the company will have five plants in central Illinois.

The new plant will be built on what is known as the Gauger land, at the east side of the city, along the Michigan Central tracks. The Joliet plant will have a daily capacity of 40 cars. Two large crushers are being installed to reduce the large sizes—characteristic of the deposits about Joliet—to commercial sizes. The company will produce material for highway purposes, railroad ballast, and commercial uses.

The McGrath Co.'s success in this line of endeavor has been decidedly marked, guided as it is by the three brothers—J. W., T. E., and T. P. McGrath, who organized it 15 years ago.

It has developed from one small plant with a capacity of one car per day to five plants with a total capacity of 150 cars per day. It is remarkable when three brothers organize and develop a business with the success that this company has had. This is partly accounted for in that each man has taken charge of a particular phase of the work in conducting the affairs of the company. J. W. McGrath is in charge of the construction and operation of the various plants; T. E. McGrath manages and directs the sales and traffic departments, and T. P. McGrath has charge of the credits and accounting department.

The other four plants are located at Mackinaw, Pekin, Chillicothe and Forreston, Ill. Sales agencies are maintained at Bloomington, Springfield, Freeport, Galesburg and Joliet.

Mining Stone at Ste. Genevieve, Mo.

A LETTER from J. R. Thoenen, mining engineer of St. Louis, has been received by ROCK PRODUCTS, in which he criticises its description of the mining methods employed at the Peerless White Lime Co., of Ste. Genevieve, Mo., as made in the December 2 issue. An extract from his letter follows:

"In reading the article as written, I have one criticism to make on the cycle of mining operations as you describe them up to the point of back-stoping. At this point you leave the impression that the back is taken down in 10-ft. sections over the entire area of the room. Permit me to correct this by saying that upon the completion of the first breast-stope on the quarry floor level, the next operation is to drive a raise at the inner end of the room and across the entire width from pillar to pillar. This raise is driven to the full height decided upon as being safe.

SAND AND GRAVEL CONVENTION

THE seventh annual meeting of the National Association of Sand and Gravel Producers will be held at the Raleigh Hotel, Washington, D. C., January 24, 25 and 26. A real program has been arranged and will soon be made public. All members are urged to attend as this convention will afford some treats that only the Capital City can offer.

With this completed, underhand backstoping or breast-stoping from the broken stone is used to break down the remaining back over the room. Thus the back is taken down in one stratum varying from 35 to 40 ft. vertically, rather than in 10-ft. lifts."

Mr. Thoenen was the engineer consulted by the Peerless Company before the quarry was changed from an open-face to a tunnel operation and is thoroughly experienced in stone mining methods. ROCK PRODUCTS is appreciative of Mr. Thoenen's correction.

Financing Big Central West Lime Company

THE Marblehead Lime Co., with general offices in Chicago, which was recently reorganized with Bernard L. McNulty, formerly general manager of the Lehigh Lime Co., as president, has completed negotiations with the Mississippi Valley Trust Co., of St. Louis, for the purchase and offering to investors of a $400,000 first mortgage 7 per cent 15-year bond issue.

The Marblehead Lime Co. has plants at Quincy, Ill., Springfield, Mo., Marblehead, Ill., Hannibal, Mo., Louisiana, Mo., and White Bear, Mo., and is the largest producer of high calcium lime west of Ohio.

I.C.C. Cancels Priority Orders

The commission vacates service orders Nos. 24 and 25 effective midnight, December 11

By Edwin Brooker
Traffic Expert, Munsey Building, Washington, D. C.

IN THE form of amendments to Service Orders Nos. 24 and 25, the Interstate Commerce Commission, at a session held on December 8, vacated both orders.

The amendments, No. 4 to Service Order No. 25, and No. 2 to Service Order No. 24, were similar in text. Amendment No. 2 to Order No. 24 reads as follows:

"It appearing, That the emergency which which caused the commission on the 30th day of August, 1922, to make and enter its Service Order No. 24, and the amendment thereto made and entered on the 18th day of September, 1922, has been measurably relieved.

"It is ordered, That said Service Order No. 24, as amended, be, and the same is hereby, vacated and set aside effective at midnight, December 11, 1922.

"It is further ordered, That copies of this order be served upon the carriers upon which Service Order No. 24 was served, and that notice hereof be given to the general public by depositing a copy of this order in the office of the secretary of this commission."

With the lifting of these orders, operators east and west of the Mississippi river are given relief that they have fought for continuously since the orders were issued.

Regardless of winter having arrived, the effect the lifting of the orders will have on the rock products industries will be noticeable. In general, especially since the issuance of Amendment No. 3 to Service Order 25, the situation has not been as tense as it was during the months of August, September and October. But in many sections, the effect of the orders in all their severity has been felt up to the present. The operators in such sections are the ones most affected by the vacating of the orders.

The thought should be kept foremost in the minds of all members of organizations that the same situation will present itself next year. But by concentrated efforts and with the support of all users of open-top cars in our industries, a bigger and stronger attempt can be made to take away from the authorities the power to put into effect such orders.

Transportation Problems

THIS department was introduced to ROCK PRODUCTS readers in the December 2 issue. As announced in that issue, ROCK PRODUCTS will regularly publish itemized lists of propositions affecting the rock industries that are before the railroads for consideration.

It is with the co-operation and aid of Edwin Brooker, commerce specialist and statistician, Washington, D. C., that this department is possible. Through this department ROCK PRODUCTS readers may learn of proposed actions of the railroads and will have an opportunity of taking action to protect their interests beforehand should such proposed actions of the railroads not be in their favor.

The following lists, grouped by district freight associations, are proposed changes covering the last two weeks:

Proposed Changes in Freight Rates

CENTRAL FREIGHT ASSOCIATION

No. 5571. Cement—Universal and East New Castle, Pa., to Logan and Nelsonville, Ohio. Present 14 cents. Proposed 13 cents per 100 lb.

No. 5584. Sand and Gravel—Kern and Covington, Ind., to Rantoul and Alvin, Ill. Present 83 cents. Proposed 101 cents per net ton.

No. 5610. Moulding Sand—Xenia and Spring Valley, Ohio, to Dayton, Ohio. Present sixth class. Proposed 80 cents per net ton.

No. 5616. Crushed Stone and Screenings—Silica, Ohio, minimum weight, marked capacity of car, as follows:

To	Present	Proposed
Addison, Mich.	88	100
Allegan, Mich	173	184
Batavia, Mich.	101	113
Chesterton, Ind.	184	196
Chicago, Ill.	184	196
Danbury, Ohio	80	90
Dundee, Mich.	81	97
Findley, Mich.	127	138
Grand Rapids, Mich.	173	184
Huron, Ohio	90	100
Kalamazoo, Mich.	161	173
Lansing, Mich.	127	138
Millers, Ind.	184	196
Osceola, Ind.	130	139
Otsego, Mich.	173	184
Quincy, Mich.	101	110
Ridgeway, Mich.	88	95
Somerset, Mich.	88	101
South Bend, Ind.	135	142
Sturgis, Mich.	113	125
Tecumseh, Mich.	76	88
White Pigeon, Mich.	125	130
Wyandotte, Mich.	104	104

No. 5632. Lime—Woodville, Ohio, and points taking same rates, to St. Louis, Mo., and other Mississippi river crossings to Quincy, Ill., inclusive. Present 23½ cents. Proposed 25 cents per 100 lb.

ILLINOIS FREIGHT ASSOCIATION

No. 784A. Crushed Stone—Proposed to reconsider action taken at January meeting, at which rate of $1.65 per net ton was approved, from Linwood and Buffalo, Iowa, to Keithsburg, Ogle, Seaton, Little York, Eleanor and Monmouth, Ill.

No. 1566. Sand and Gravel—Minimum weight 90 per cent of marked capacity, from Chillicothe, Ill., to Kickapoo, Limestone, South Pekin, Green Valley and Allen, Ill., 90 cents; to Luther, Hubly, Sweetwater, Culver, Barr, Bando, Archer, Lick, Compro, Virden and Girard, Ill., 99 cents; to Green Ridge, Schoper, Womac and Bendl, Ill., 104 cents; to Radnor, Akron, Spoor, Camp Grove, Ill., 90 cents; to Broadmoor, Morse, Buda and Langley, Ill., 99 cents per net ton.

NEW ENGLAND FREIGHT ASSOCIATION

No. 3900. Moulding Sand—Minimum weight, 90 per cent of marked capacity, Ushers, N. Y., to Caledonia, N. Y., 9 cents per 100 lb.

No. 3915. Lime—Minimum weight, 60,000 lb., from Dover Plains, N. Y., to various points in Maine, rates ranging from 20 to 25½ cents per 100 lb.

No. 3930. Cement—Minimum weight, 50,000 lb., from Hudson Upper, N. Y., to various stations on the New York Central and West Shore railroad, illustrative to New York, 11 cents; to Buffalo, N. Y., 14½ cents per 100 lb.

SOUTHERN FREIGHT ASSOCIATION

No. 8062. Cement—Portland, Ga., to various points in North and South Carolina and Virginia, on basis of present rates in effect from Rockmart, Ga.

No. 8072. Crushed Stone and Screenings—Minimum weight, marked capacity of car, from Hellams, S. C., to points on the Southern railway on basis of mileage scale published in Tariff I. C. C. No. 9490.

No. 8102. Cement—Birmingham, North Birmingham and Spocari Ala., to stations on the Winston-Salem Southbound railroad. Revision to reflect proper relationship with other cement producing points.

No. 8104. Sand and Gravel—Various Louisville and Nashville railroad stations to Pensacola, Fla., and from Flomaton and Berrylum to Pensacola and Alabama division, Louisville and Nashville railroad, to apply same rates on mixed shipments of sand and gravel as apply on straight shipments.

No. 8109. Crushed Stone—Eastern points to Carolina points. To cancel present class rates on these commodities so as to permit the combination of local rates to apply, which are lower.

No. 8116. Cement—Caira, Ill., to various Louisville and Nashville railroad stations on basis of rates now in effect to Milan, Paris, McKenzie, Clarksville and Nashville, Tenn.

No. 8180. Sand and Gravel—Garysburg, N. C., to Severn and Pendleton, N. C., 79 cents; to Conway, Milwaukee, Menlo, Potecasi, Woodland, Rich Square and Roxebel, N. C., 81 cents; to Kelford and Lewiston, N. C., 90 cents per net ton. Present rates on basis of Class A.

No. 8181. Sand and Gravel—In cases where minimum weights now provide for stenciled or marked capacity of the car, it is proposed to add provision specifying that cars loaded to visible capacity will be charged for at the actual weight. This change being made on account of the use of low-sided cars, in which it is impossible to load to marked or stenciled capacity.

No. 8188. Lime—Willock and Hematite, Tenn., to Cincinnati, Ohio; Lexington, Covington and Newport, Ky. Present 327 cents. Proposed 259 cents per net ton.

No. 8189. Lime—It is proposed to revise the rates from Alabama and Tennessee kilns to New Orleans, La., and intermediate points on the Louisville and Nashville railroad so that the rates from Alabama kilns on the Louisville and Nashville railroad will not be less than 45 cents per ton under the rates from Sherwood and Summittville, Tenn.

No. 8199. Cement—Birmingham, Leeds, Ragland and Spocari, Ala.; Kingsport and Richard City, Tenn., to Ohio river crossings east of Paducah, Ky., via the Illinois Central railroad. It is proposed to cancel on account of no movement via this route.

No. 8223. Slag—Augusta, Ga., to Dunbarton, S. C., 77 cents; to Barnwell, S. C., 90 cents; to Copes, S. C., 99 cents; to Lone Star, S. C., 113 cents; to Lynchburg, S. C., 131 cents; to McColl, S. C., 149 cents; to Fayetteville, N. C., 158 cents; to Walker, N. C., 167 cents; to Battleboro, N. C., 180 cents, and to Drum Hill, N. C., 198 cents per net ton.

SOUTHWESTERN FREIGHT BUREAU

No. 6926. Sand and Gravel—To publish mileage scale of rates on these commodities from various Southern Pacific System railroads to points on the Texas and New Orleans railroad as per Item 10390 of S. W. L. Tariff 21—Series.

No. 6934. Cement—It is proposed to reissue Item 280 of S. W. L. Tariff 55F between points in Oklahoma, to revise the single line mileage scale rates in line with rates recently prescribed by the Interstate Commerce Commission in a supplemental order on Docket 8182 for application between points in Kansas.

No. 6947. Gravel and Crushed Stone—G. N. and A. railroad stations to Alexandria, La., on basis of 10 cents per 100 lb.

No. 7010. Sand and Gravel—Kansas City, Mo., to stations on the St. Louis and San Francisco railroad in southern Missouri and Arkansas on the following mileage scale:

	Cents
30 miles	70
60 and over 30 miles	90
100 and over 60 miles	110
140 and over 100 miles	130
180 and over 140 miles	140
220 and over 180 miles	160
260 and over 220 miles	180
300 and over 260 miles	200
350 and over 300 miles	220
400 and over 350 miles	230
450 and over 400 miles	250
500 and over 450 miles	270

TRUNK LINE ASSOCIATION

No. 10757. Glass and Moulding Sand—Hancock-Berkeley Springs district to Sheffield, Pa. 15½ cents per 100 lb.

No. 10760. Plaster—Akron and Oakfield, N. Y., to stations Boltonville to Montpelier, Vt., inclusive, 25 cents per 100 lb.

No. 10766. Cement—Bath, Nazareth, Stockertown, Northampton, Pa., to all stations on Morristown and Erie railroad, 11 cents per 100 lb.

No. 10772. Slag (in bulk)—Reading, Birdsboro, Pottstown, Swedeland and Lebanan, Pa., to Richmond, Va., $3 per net ton.

No. 10780. Slag—Pittsburgh, Bessemer, South Duquesne, Johnstown, Pa., to Pennsylvania railroad stations, Elrico and Slickville, Pa., rates 63 to 113 cents.

No. 10790. Sand, Gravel and Crushed Stone—To establish a switching rate of 45 cents per net ton from private sidings on the Western Maryland railroad to public team tracks on the Baltimore and Ohio railroad at Cumberland, Md.

WESTERN TRUNK LINE

No. 2848. Sand—Beloit, Wis., to Cedar Rapids, Iowa. Present $2.10. Proposed $1.80 per net ton.

The Southern Freight Association has approved propositions listed under Dockets Nos. 7824 and 7920 as shown in Rock Products of December 2.

Columbia Quarry Co. to Build New Plant and Remodel Others

THE Columbia Quarry Co. of St. Louis is preparing to build a new crushed limestone plant at Chester, Ill. This plant will have a No. 8 gyratory crusher as its initial breaker and a No. 6 and No. 4 as secondary units. The company intends to have the plant in operation on March 1.

In addition to the building of the new plant at Chester, the company is also going to remodel its plants at Krause, Columbia and Valmeyer. A No. 18 gyratory crusher will be installed as a primary breaker at quarry No. 1, located at Krause, and one of the same size will also be added to the Valmeyer plant.

The plant at No. 2 quarry, near Columbia, will be completely remodeled and a No. 8 gyratory crusher will be added. This installation is made necessary by the increased business the company has obtained through the traction lines being brought to this plant.

With the exception of the changes to be made at the Valmeyer plant, all of this work will be completed and the plants will be operating on or before March 1 of next year. At that time the company intends to begin the erection of a slag plant.

Lauer Co. Expands Plant

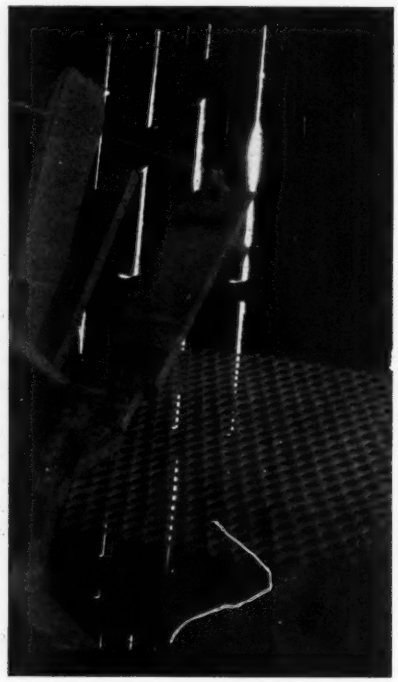
IN order to meet the demand for crushed rock in the construction of roads, bridges and buildings, the George C. Lauer Stone and Construction Co., 552 Gilfillan block, St. Paul, is refinancing and reorganizing to increase its output.

The company's plant and pits are at Mendota, opposite Fort Snelling, on the Milwaukee and Omaha railroads. The property also contains a deposit of more than 3,000,000 cu. yd. of pure white silica sand, besides talc, yellow limestone, and bluestone.

Hints and Helps for Superintendents

An Alarm That Never Fails

IT would be hard to estimate the time and money lost in any one stone crushing plant in a year due to screen trouble. Belts coming off or breaking; bolts dropping out; clogging of perforations and blocking of chutes—all these sources of trouble are expensive. These troubles, as well as others cannot always be avoided, but if they are taken care of immediately after they take place the damage resulting can be reduced.



When the rope is released and this weighted block falls on the screen, it is a signal to the crusher feeder that something is wrong upstairs

In most plants a man is stationed in the screen room to see that the machinery is functioning properly, and if anything should go wrong it is his duty to have the feed to the crusher stopped at once. This prevents a great volume of crushed stone from being discharged in a stalled or broken screen, or in a blocked chute.

The man stationed in the screen room in many plants is in touch with the crusher feeder either by electrical bell or whistle signals. In other plants he is within earshot of the feeder and can warn him to stop feeding by yelling. Where none of these methods is employed, the man must go to the feeder and tell him that something is wrong and to stop feeding. The latter is a poor method as much time is lost and a large amount of stone is put to the screen before the feeding is stopped.

A novel and inexpensive contrivance used as a signal from the screen tender to the crusher feeder is in use at the plant of the C. H. Ziegenfuss Co., Inc., Allentown, Pa. A flattened section of perforated screen is suspended by wires from the ceiling near the crusher. As shown in the illustration, a block of wood, weighted with an iron ball, is hinged to a post near the suspended screen so that when dropped it falls directly on the screen. A rope attached to the hinged block extends to the screen room, passes through a pulley and is within reach of the screen tender. By pulling the rope and then releasing it, the weighted block drops on the suspended screen with a crash that serves as a signal to the feeder that something is wrong in the screen room.

This is a "never fail" alarm as it has no mechanical parts to get out of order and it can be heard from any point on the crusher floor level.

Electric Welding "Anywhere on the Job"

A SECOND glance at the accompanying illustration and one will observe that the house in the foreground is mounted on wheels. Within this house is a complete 500-amp. direct-current electric welding outfit equipped with 1500 ft. of cable.

As this equipment is mounted on a standard-gage quarry car truck, it can be moved into the quarry to weld a broken steam shovel part or it may be taken to the plant to weld a broken crusher or any other machine. Since the tracks extend to all important units of the entire operation, the welding car can be moved to any unit desired and at an expense comparatively lower than that of bringing the broken parts to a centrally located stationary welding outfit.

At the average operation is generally found either small portable acetylene or stationary electric outfits. Both, however, have disadvantages. The acetylene equipment, small enough to be portable, is not capable of welding large parts, while stationary electric equipment necessitates bringing the parts to it.

This portable electric equipment is in use at the plant of the Birdsboro Stone Co., near Birdsboro, Pa.

This 500-amp. electric welding outfit on wheels can be taken to the spot where repairs are needed

Another Way to Protect Elevator Belts

MANY different contrivances have been designed to serve as protectors and preservers of elevator belts in crushed stone or sand and gravel plants. Stones and pebbles between the belt and the buckets, or between the belt and the foot-pulley, soon wear holes in the belt, until finally a new belt is needed.

The C. H. Ziegenfuss Co., Inc., Allentown, Pa., has installed on all of its elevators a simple arrangement that prevents stone from falling between the belt and the foot-pulley.

The illustration shows how a piece of 10-gage sheet iron has been inserted over the foot-pulley of one of the company's elevators.

This sheet of iron is the width of the face of the pulley and is long enough to permit being suspended in such a way as to extend from the top of the pulley to the return side of the belt.

How stones are prevented from getting between the pulley and belt

It will be noted that a piece of thick belting, corresponding in size to the iron sheet, has been riveted to the sheet to prevent squeaking.

Throwing a Switch by Cable

SOMETIMES it is necessary that a switch be located part way up an incline in order to make use of the available storage space at the foot of the incline. Wherever possible, in such cases, a spring switch should be used; a throw switch could not be easily reached by a man at such a point.

At the Martinsburg, W. Va., plant of the Blair Limestone Co., however, a common throw switch is installed that is controlled from the foot of the incline by cable.

The insert in the accompanying illustration of this company's installation shows how this is accomplished. The controlling lever is located at a point within reach of the man who fastens the cable to the cars to be pulled up the incline. It is only necessary to throw the switch when a car is being let down, as loaded cars go up the incline from the right track and the empties are returned to the left track.

Increasing Air Pressure in the Quarry

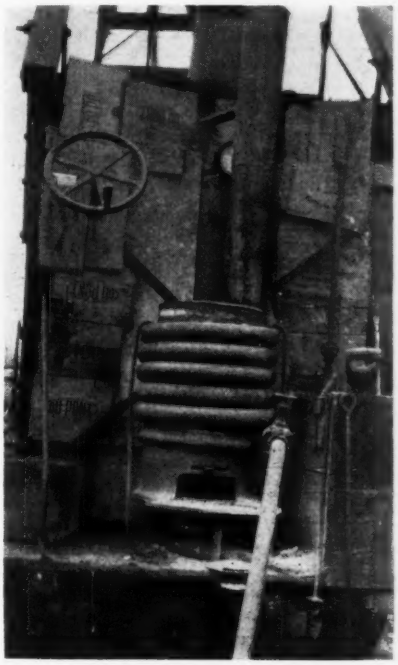
IT WAS discovered many years ago, in the mining sections of the West, that pre-heaters on the compressed-air equipment increased the efficiency of the machines. Actual laboratory tests have shown that for every heat degree Fahrenheit applied to compressed air the expansion is increased 1/2000, thus increasing the pressure.

WHY don't YOU send in a "Hints and Helps" item? Remember that kink you put in your plant some time ago. Just jot down a rough description of it and send it in. We'll dress it up. And send a pencil sketch or photograph, too. Also, ROCK PRODUCTS is only too glad to pay for such items.

In one of H. E. Millard's quarries, near Lebanon, Pa., several well drills, powered by compressed air, are in use. When first installed these machines did not prove satisfactory to the company, as they were not drilling in proportion to their rated capacity. A machine of another make was installed, but with the same result.

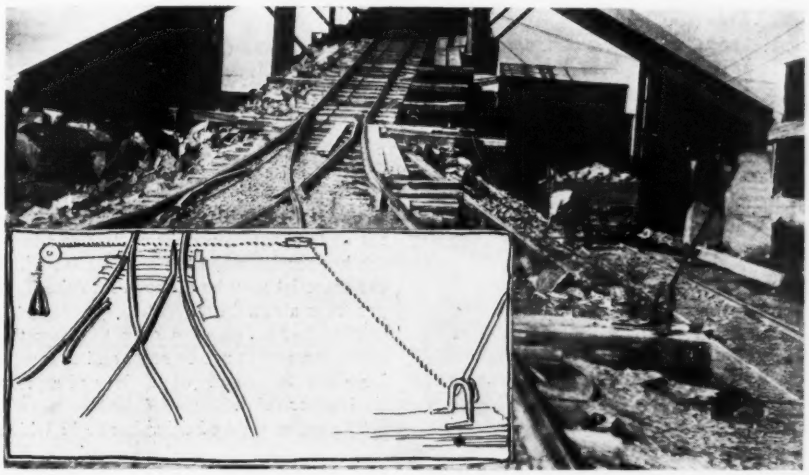
The company at this time began using pre-heaters on the drills. The first one—made wholly as an experiment—was made of a common upright coal stove, about which was coiled a length of 2-in. pipe. The air line was connected on one end of the coil and at the other end direct connection to the machine was made.

A fire was made in the stove, the air was turned on, and the machine started. The difference in the way it drilled was quite noticeable; it drilled more feet per hour than formerly and with no more air consumption.



This pre-heater mounted on the rear end of a well drill increases the air pressure

Since that time the company has had specially designed stoves built and installed them on all of its drills. The illustration shows the installation of one of the pre-heaters on the rear of a well drill.



How a switch located part way up an incline is thrown

Questions and Answers

Edmund Shaw, Consulting Engineer, Chicago, Ill., Expert on Problems of Screening, Washing and Hydraulic Separation

THE TECHNICAL STAFF OF ROCK PRODUCTS

Edwin Brooker, Washington, D. C., Consulting Expert on Matters of Transportation and Freight Rates

10. **Sand-Lime Brick Possibilities.**—We are interested in the manufacture of sand-lime brick, and would appreciate it if you would tell us something about the product and how it is made.—C. G. Co., Texas.

A.—Sand-lime brick is a composition of sand and lime which is mixed and thoroughly kneaded, and then moulded in a press under a pressure of from 25,000 to 35,000 lb. per in., after which it is subjected to a six- or seven-hour steaming in a cylinder, under a pressure of 120 pounds live steam. The time of steaming varies, of course, with the nature of the material and method of manufacture.

The silica sand must be clean and average around 90 to 95 per cent silica. This sand must be free from organic matter, iron and above all, must not contain any magnesium. The sand must also be of a consistent fineness, preferably ¼ in. down. The lime is bought in burnt or hydrated form, and if the lime is bought as burnt lime it should be hydrated at the plant and storage bins must be provided for it so as to allow for proper seasoning.

The lime must always be a very high calcium lime and contain absolutely no magnesium as magnesium expands on heating and therefore would expand in the brick and cause it to burst.

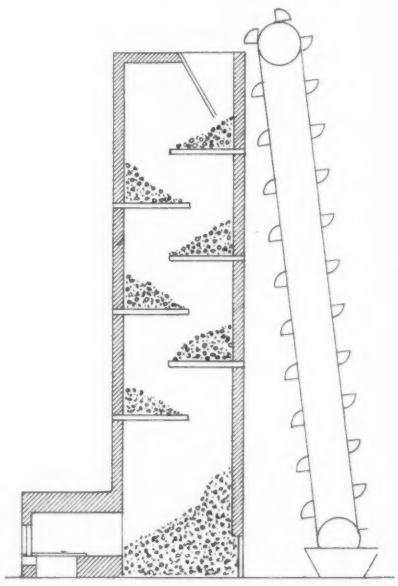
The price range of sand-lime brick is anywhere from $7 to $18 per thousand, depending upon the locality and competition with other forms of brick. A complete description of a modern sand-lime brick plant will be found in the September 23, 1922, issue of Rock Products.—C. A. B.

11. (A further answer to Q. 9, "Drying and Screening Stone or Washing It?" published in Rock Products, December 2.) All such questions have finally to be settled on the basis of relative cost. Generally, it is cheaper to pump water to wash off damp and sticky clay from the surface of stone than to dry the stone and then rattle off the dried clay. But the drying method is preferable where it is difficult to obtain water and where there is so little rainfall that the stone does not have to be dried to make the separation except for a comparatively few days in each year.

The drying and rattling method of removing clay is practicable and is applied on a commercial scale. The writer has seen it very successfully used in cleaning phosphate rock, the kind that has to be quarried. In this case a rotary drier was used.

But the 6-in. cubes you speak of seem to be rather too coarse to dry in a drier of this kind. At least the writer has never seen such coarse and abrasive material as limestone crushed to 6-in. cubes fed to a rotary drier, and he believes that feeding such coarse material would be rather severe treatment.

There are, however, two types of driers in which such coarse material may be dried without much wear on the parts upon which the material falls. One of these is the tower drier shown in the accompanying sketch. It is a tower of brick or concrete with shelves, which are usually made of steel bars. These shelves are horizontal and the material accumulates on them to form its own slope. It is on this bed of material that the large pieces strike, and thus the wear on the shelves is avoided. The sketch shows the drier fed by an elevator, but it may be fed by



a belt conveyor, or, where there is plenty of fall to the ground, the tower may be set at the foot of a hill and tracks run to the hopper from the top of the hill so that the material may be dumped into the hopper from a small car.

The sketch is drawn only to show the operation and is not to scale and the parts have not the proper proportions of a practical tower drier.

The other type of drier is one in which a pan conveyor travels in a long flue against a current of hot air. This type has been well worked out for use with higher temperatures than are used in drying for the roasting and sintering of ore, and there is no reason why it should not make a very practical drier, using a low temperature.—E. S.

12. **Dragline or Dredge?**—We are a new company, and being inexperienced in the sand and gravel business, we would like to know under what conditions a dragline is better than a dredge for getting out sand and gravel or vice versa.—C. N. T., New Jersey.

A.—No hard-and-fast rule may be given by which it may be determined whether a dragline or a dredge would be best in any particular case. This would have to be determined by an engineer who had familiarized himself with the local conditions and the nature of the deposit.

Each machine has certain advantages which the other does not have. The great advantage of the dragline is that it can work in any kind of ground, while the dredge cannot work in ground which contains too many large pieces.

The great disadvantage of the dragline is that its capacity decreases as it works farther away from the plant, because it takes so much longer for the bucket to make the round trip. The capacity of the dredge is constant, but it uses more power as it works farther away from the plant, because it takes more power to force the water and sand and gravel through the longer line.

The dredge pumps the water required for washing along with the material to be washed, but a separate pumping plant has to be installed to pump the water for washing the material mined by a dragline.

The dragline can work in ground under which there is not sufficient water to float a dredge. Dredging operations have failed because the ground was not examined to determine that there was sufficient water under all parts of the ground before beginning operations.

Deposits of great depth may be worked by a dragline and such deposits have been worked to 75 ft. below the water level. Theoretically, a dredge could work to any depth, but a long suction pipe is unwieldy, and it is not usual to make one longer than 40 ft.

It has been presumed that the inquiry relates only to the ordinary type of suction dredge. The ladder dredge can work in any kind of ground that a dragline can work in, but it is so expensive a machine that it is only used in the largest operations.—E. S.

Accident Prevention

An Important Aid to Construction—II

By R. C. Marshall, Jr.
General Manager, Associated General Contractors of America

THERE is also the item of direct labor-time lost through accidents. Mr. Davison, of Dwight P. Robertson & Company, last year showed where, over a period of some three months, this company had spent about $9,000 in lost time. Where the accident frequency is high, this item assumes significant proportions.

Wages themselves are based in a degree upon the hazard factor, and in general are increased with frequency of accidents on the work. In reality the hazard rate means very little to the workman in the long run, as in case of disablement it is not sufficient to compensate for the disability. This rate stands as an undue expense of the work. A better plan would be to reduce the hazard and eliminate the necessity for excessive hazard wages.

Another wasteful effect of accidents is the indirect loss arising from poor efficiency and morale of the working force when disrupted by serious accidents. Moreover, for every man disabled another must be trained, and the cost of his training stands as a charge against construction. Each such accident represents a more or less distinct increase in labor cost. A reduction of all of these items is not only possible but has been accomplished by individual companies through the application of safety methods.

Reduction of cost and preservation of human welfare are the two most tangible benefits from this work; but the third, a less perceptible one, is of scarcely less importance and probably it is the most urgent; this is the improvement of industrial relations.

Industrial relations, of which so many volumes have been written in recent years, and which were once considered a subject that had principally to do with educators and social students, is today a real factor affecting every manufacturer and every contractor. Though not a new problem, it has in recent years raised many new difficulties in the conduct of construction operations.

A glance over industrial history since mediaeval times is sufficient to demonstrate that, as industry expands and as the nation turns more from an agricultural to an industrial country, the complexities of industrial relations increase. Sooner or later these complexities must be ironed out by constructive efforts on the part of both labor and management, and each step that management can take to make the interests of labor and itself coincident constitutes a gain for both.

Safety Calendars for 1923 Ready Now

The original for this and for the twelve calendar pages are beautiful oil paintings by R. James Stuart, one of America's leading artists.

Placing this Safety Reminder in the homes of your workers will prevent accidents and decrease accident costs.

SAFETY CAMPAIGN FOR 2 CENTS A MONTH

Giving a Safety Calendar by employers to their workers has become a regular annual event in thousands of plants throughout the country because it is a gift that all are pleased to receive; it expresses a kindly thoughtfulness that every employer is glad to show to his employes; it attacks the "take-a-chance" attitude of the careless workman; it strengthens his spirit of caution toward avoidable risks; it pays a big profit in employe good-will and lowered labor turnover.

SAMPLE CALENDAR UPON REQUEST

National Safety Council
NON-COMMERCIAL CO-OPERATIVE NOT-FOR-PROFIT
168 North Michigan Avenue, Chicago

Co-operative Spirit Being Engendered

When employes know that management is exerting an earnest effort to protect them from occupational accident, a more co-operative spirit is certainly engendered. It eliminates in a measure the hardness and soullessness with which modern industry is charged, and makes up in some degree for the personal contact that has been lost. It is questionable whether the blame for antagonism rests solely upon the employees, when we recall that during the last generation those humanitarian measures of safety provision now commonly accepted as reasonable and proper were bitterly opposed by a majority of employers.

Safety work backed by management itself obviates the need of safety statutes which for years afforded practically the only means of instituting safety provisions. It not only accomplishes far more than can ever be required by law, but removes one important obstacle to mutual understanding. Safety work in construction, where the period of employment with individual companies is usually short, is believed to have produced a marked improvement in industrial relations between the employes and those companies who have carried on such work.

In the matter of holding an organization together during a period when labor is scarce, the advantages of safety work become apparent. Those companies that have carried their safety promotion to an effective point undoubtedly find it an asset in holding their men. It is conceivable that the time may come, in construction as in certain manufacturing industries, when workmen will be able to choose between the companies who make their work as safe as possible and those who disregard safety.

There is another consideration which all of us might consider who deplore the increasing cost of government. The drain on state and federal income incurred through caring for persons disabled is something worth considering. Every disabled workman in the building industry, where the supply of labor is insufficient, adds to the labor problem; and every disabled worker in any industry takes one unit from the ranks of producers and, when his maintenance falls upon the community, adds an increment to government expense.

(To be continued)

Quarried from Life

By Liman Sandrock

The End of a Perfect Trip

ALBERT Y. GOWAN and Mrs. Gowan, after a 45,000-mile globe-circling voyage in their 90-ft. yacht, the "Speejacks," are home again. The trip took 16 months for its completion!

Undoubtedly, it would take a volume to tell of the wonders they saw, the strange places they visited—the thrills, the humors of it all. On some future occasion, however, some of us may see the 9000-ft. film they made during this trip.

Visits were made to the Holy Land, to the Queen of Sheba's tomb, the spot where Cain and Abel fought; to the Solomon islands, where the local ordinances forbid the eating of policemen. The civilians did this thing; the flavor of their own kind does not appeal to brother flat-foots.

On the island of Fiji the Gowans were welcomed by the chiefs under arches of poinsettias. Here the natives indulge in tara-root drink, which quenches the thirst but paralyzes the legs—trespassing on the regular bootlegger's job, as it were.

The party had several narrow escapes. They were nearly wrecked on a coral reef when the propeller got out of order, and the scenery at hand furnished 8-ft. conger eels squirming about the yacht. On such an occasion, you and I would start thinking that the Boul Mich and the Loop would be heaven to us—and so did the Gowans. And then there were whales big as the little "Speejacks" itself. It was a thrill-a-minute trip, from all accounts.

We wish we could tell you of the hundreds of incidents of this wonderful trip, but then we'd crowd out the "Hints and Helps" man, the "Q. and A." folks—encroach on the Market pages—and our readers would not like that. The daily press has kept you fairly well acquainted with the Gowans' trip from time to time and told you lots more than we can get on this page.

So, the Gowans are home again, and this is the end of a perfect trip. Personally, our voyaging is confined to "the trip to Milwaukee," where we do not stay long enough to meet up with its conger eels, its Fiji sundaes, lose our propeller, or experience any great thrills. The fresh water, however, sufficiently refreshes us to know that we're main glad to get back home—as are the Gowans. As Mrs. Gowan told a New York correspondent: "I'm glad to get back, and I'll be still happier when I reach Chicago"—the same feeling, in minute degree, we entertain when we come back from Milwaukee.

Welcome home, Mr. and Mrs. Gowan!

Life's Just One Darn Stone After Another

Dear Lyman Sandrock:

In a moment of distraction during freight-car shortages and other bugaboos of the stone man, the following eased itself into being—and I have wished it on you:

Who dares say the stone industry is not big, basic and, above all, American?

From the cradle to the grave, stones and rocks enter continuously into our lives. The nurse starts to rock you soon after you lustily announce your arrival; the doting mother croons a rockaby shortly thereafter, and later the old man in his rocker endeavors to rock you to sleep and silence—more or less successfully.

As you grow into boyhood there's the rockinghorse; the joys of stoning everything in sight. Later on, the earthly quest for "rocks" is begun, while you shoot off skyrockets, rock the boat, and receive the flapper's stony glares.

And then comes the caveman tactics of the Stone Age, and you grab yourself a life partner, hooking her with a glass rock. Later, may be, your old bean is rocked by a flying stewpot in an argument over the division of the rocks. In your twin lizzie supercylinder there's a weekend trip to the daisies—if the lizzie rocks easily—as you contentedly puff away on the ol' Blackstone.

You try to maintain your way by proper ballasting, but suffer a rejection or two withal. Then you pay up for your infantile rocks in the cradle by furnishing the same motive power for the same boat—only, this time, it's *your* kiddy who's being rocked.

Finally, when your season is about to close and the quarry of rocks you sought through life is still beyond the rainbow, you leave old Mother Earth's storage pile and the undertaker gets his rocks for certain excavations—and you wear a heavy stone over your brow. You return to the dust from whence you came.

Yea, bo, it's a stony road throughout!

GEORGE E. SCHAEFER,
General Crushed Stone Co.

Robert Lesley at His "Ain Hame and Fireside"

The technical and lay press have given much publicity to Robert Whitman Lesley recently, both in his capacity as first president of the Portland Cement Association and as the honored subject of the concrete bust modeled and cast by the boys at Mooseheart—the community founded by Secretary of Labor Davis—and presented by the Secretary to the association.

Let us present Mr. Lesley in another role than that of the man of large affairs. Here he is, at "his ain hame and fireside." Undoubtedly, it is the wish of most of us that when we arrive at the sixty-ninth milepost, as has Mr. Lesley, we, too, will be pictured in like manner—keen and alive to all that the ripened years will have brought us and bearing those years as if, paraphrasing Pope, "age cannot wither, nor custom stale our infinite variety."

Editorial Comment

Pernicious Taxation

A Montana gypsum producer calls our attention to the danger in a taxation law recently enacted by the legislature of his state. The danger is to other producers in other states. The damage in his state has already been done. He merely wishes to advise producers in other states to lock their doors before their horses are stolen.

The Montana legislature has imposed a tax of 20 cents per ton on plaster and 4 cents per barrel on portland cement. This is over and above the state's net proceeds from the miner's tax, personal property taxes, etc. It is over twice the customary royalty paid by the producer to the owners of quarries and mines *for the raw material itself*. It amounts to double taxation and the constitutionality of the law is questionable. It adds unjustifiably to the cost, and therefore to the price, of basic commodities. It offers serious obstacles to the sale of Montana products in competition with the same commodities mined and manufactured elsewhere.

A word to the wise is sufficient. While this may look at the moment like a purely local issue, let the producer beware. The costs of federal, state and local governments are growing by leaps and bounds. Someone has to pay the fiddler, but let the payment be equitably distributed, at least.

Labor Shortage Preparedness

The outstanding features of this winter in the quarry industries are the inquiries and orders piling up with machinery and equipment manufacturers for labor-saving devices. All the big machinery manufacturers have more business in sight than ever before. And all this is the direct result of a nation-wide common-labor shortage; and the tremendous activity in the building industries. Producers have come to the inevitable conclusion that elimination of all possible common labor is not merely an economic necessity, but actually a price to be paid for operating at all.

The labor shortage is being felt most in the East—but that is merely because all things are relative. There has been a shortage in the Central West so long that producers there have accustomed themselves to it. Most Middle West quarries have been for years operated by machine methods far more than similar quarries in the East.

There is no relief from the common labor shortage in sight for next year. The immigration laws can be changed only by act of Congress, and any change that may be made in 1923 could not possibly become effective in time to be a factor in next year's labor situation. Moreover, there will be much opposition to any letting down of the present immigration bars.

On every hand come predictions of a big construction year in 1923. There is little prospect at this writing of any let-up in building work in spite of cold weather, although construction-materials prices are from 25 to 30 per cent higher than they were last year at this time. Much work will of necessity be carried over another year because of the failure to make material deliveries this year.

Prices of machinery and equipment are still generally considered high. Nevertheless, there is slight prospect that they will be lower for a long time to come. Hand labor—hand-loading, hand-driven mules, hand dumping—all these things will soon be history.

Dolomite Possibilities

Elsewhere in this issue is the record of some highly interesting experiments in the use of dolomite as a source of magnesia, or oxychloride, cements. The growth and the development of these cements for stucco and floors has been one of the most remarkable things in the recent history of the rock products industry. Yet magnesite, the present source of magnesia, is a comparatively rare mineral. It is found in the United States only in isolated parts of the Pacific coast region. Dolomite, on the other hand, is one of the commonest of rocks, or minerals. Whole states in the Middle West are covered with it; generally but a few feet below the surface.

The opportunities of using magnesia cements, if they can be produced at a cost to compete with other ordinary plaster and cementing materials, are almost limitless. That they have made such progress as they have at their present high-cost gives some faint inkling of these possibilities if the cost were reduced by a half or more, as it may be, if dolomite becomes the source of the cementing material. The experiments quoted show that properly burned dolomite and calcium chloride (a waste product of the alkali industry) *will* make a good cement.

This alone is a very important fact. It has long been recognized that free lime (CaO) in magnesia is detrimental to its cementing qualities, but calcium carbonate or lime in an unburned form ($CaCO_3$) apparently acts merely as an aggregate. A succeeding article will describe a method of so burning a dolomitic limestone that the CO_2 will be driven off the magnesium carbonate ($MgCO_3$) and retained in the calcium carbonate ($CaCO_3$). The process has been patented by the authors of the article referred to, but it is so simple in theory that it opens up some new ideas in the whole field of rock products chemistry, and emphasizes what a large and unexplored field lies ahead of the American lime industry.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.50	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	.....	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	.....
Prospect, N. Y.	.75	1.25	1.25	1.25	1.25	.....
Walford, Pa.	.....	1.30	1.30	1.30	1.30	1.30
Western New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alton, Ill.	1.50	.....	1.50	1.35	.....	.....
Buffalo, Iowa	.90	.....	1.20	1.00	1.05	1.05
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	1.30	1.70	1.30	1.30	1.30	.....
Dundas, Ont.	1.00	1.00	1.35	1.25	1.10	1.10
Faribault, Minn.	.....	.....	.....	.....	1.75	.....
Greencastle, Ind.	1.25	1.10	1.00	.90	.90	.90
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50
Krause, Columbia and Valmeyer, Ill.	1.00@1.30	1.00@1.30	1.00@1.30	1.00@1.30	1.00@1.30	1.30@1.50
Lannon, Wis.	.85	1.00	1.00	1.00	1.00	1.00
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.80	1.35	1.05	.95	.90	.....
Montrose, Ia.	.....	1.50	1.60	1.55	1.45	1.40
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Southern Illinois	1.35	1.40	1.35	1.30	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
			Prices include 90c freight			
Waukesha, Wis.			All sizes 1.00 per ton			
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bromide, Okla.	.75	.....	.....	1.50	1.50	.....
Cartersville, Ga.	2.00	2.00	2.00	1.40	1.25	.....
Chickamauga, Tenn.	.85@1.00	.85@1.00	.....	.85@1.00	.85@1.00	.....
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.50	1.15	1.40	1.25	1.15	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Dallas) Tex.	1.00	1.40	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	1.65	1.60	1.55	1.45	1.40
Cape Girardeau, Mo.	1.35	.....	1.10	1.35	1.10	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2 20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	.95	.....
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.25@1.40	.....
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Eastern Massachusetts	.60	1.85	1.40	1.40	1.40	1.40
Eastern New York	.75	1.50	1.30	1.30	1.40	1.40
Eastern Pennsylvania	1.15	1.50	1.45	1.35	1.30	1.30
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	1.75	2.10	2.10	1.80	1.80	1.75
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.50	1.60	1.40	1.30	1.30	.....
Columbia, S. C.—Granite	.....	.....	2.50	2.25	2.00	.....
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.55	1.55	1.40	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.30	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.90	1.75	1.75	1.40	1.40	1.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	2.50@3.50	.....	2.00@2.25	2.00@2.25	.....	1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa.—Analysis, 97% $CaCO_3$ —100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk	3.00
Hillsville, Pa. — Analysis, 96.25% $CaCO_3$; 75% thru 100 mesh; bulk	4.50
Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; 95% thru 50 mesh; bags, 4.00; bulk	2.50
New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk	3.00
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk	3.00
Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$—90% thru 100 mesh	6.00
50% thru 50 mesh	4.00
Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh	5.00
Pulverized limestone	1.35
Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; sacks	4.50
Bulk	3.00
Piqua, Ohio—70% thru 100 mesh; bags, 5.00; bulk	3.50
90% thru 100 mesh; bags, 7.00; bulk	5.50
Yellow Springs, Ohio—Analysis 96.08% $CaCO_3$, 63% $MgCO_3$; 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk	4.25
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 50% thru 100 mesh	2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$, 90% thru 100 mesh	4.00
50% thru 100 mesh	3.00
Hot Springs, N. C.—50% thru 100 mesh, sacks, 4.25; bulk	3.00
Knoxville, Tenn.—80% thru 200 mesh	3.50
80% thru 100 mesh	2.70
(Bags extra 1.25 per ton)	
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif. — Analysis 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone

(Crushed)

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.2.
Bedford, Ind.—Analysis 98.5% $CaCO_3$, .5% $MgCO_3$; 90% thru 100 mesh	1.50
Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh	1.50
Buffalo, Ia.—90% thru 4 mesh	1.00
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$—90% thru 50 mesh	1.50
90% thru 4 mesh, cu. yd.	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh	1.00
Columbia, Ill., near East St. Louis—½-in. down	1.25@1.80
Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25
Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Lannon, Wis.—Analysis 54% $CaCO_3$, 44% $MgCO_3$; 53% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00
Milltown, Ind.—Analysis 94.41% $CaCO_3$, 2.95% $MgCO_3$; 33.6% thru 100 mesh, 40% thru 50 mesh ..... 1.25@1.65
Mitchell, Ind.—Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$, pulverized limestone 1.50
Montrose, Ia.—90% thru 100 mesh 1.25
Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh ..... 1.50@2.00
Ohio (different points), 20% thru 100 mesh; bulk ..... 1 25@1.50
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh 1.30
Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 50 mesh ..... .75
Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh ..... 1..0
Waukesha, Wis.—No. 1 kiln dried 2.00
No. 2 Natural 1.75
Alderson, W. Virginia—Analysis 90% $CaCO_3$; 90% thru 50 mesh 1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ 2.00
90% thru 4 mesh 1.50
Cartersville, Ga.—Analysis 66% $CaCO_3$, 33% $MgCO_3$—all passing 10 mesh 2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh 3.00
50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh 2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh 1.75
Ladds, Ga.—50% thru 50 mesh 2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCo_3$; 50% thru 50 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk 1.80
Tulsa, Okla.—90% thru 4 mesh ..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. 2.25
Berkley Springs, W. Va. ..... 2.00@ 2.25
Cedarville and South Vineland, N. J.—Damp, 1.75; dry 2.25
Cheshire, Mass. ..... 5.00@10.00
Columbus, Ohio ..... 2.00@ 2.50
Dunbar, Pa. 2.50
Falls Creek, Pa. 2.25
Hancock, Md.—Damp, 1.50; dry 2.00
Klondike and Pacific, Mo. ..... 2.00@ 2.50
Mapleton, Pa.—Damp, 2.00; dry 2.75
Massillon, Ohio 3.00
Michigan City, Ind. ..... .50@ .55
Mineral Ridge, Ohio ..... 2.50@ 2.75
Green 2.00
Montoursville, Pa. 1.75
Oregon, Ill. ..... 1.25@ 2.00
Ottawa, Ill. 2.50
Pittsburgh, Pa.—Dry, 4.00; damp 3.00
Rockwood, Mich. 2.50
Round Top, Md.—Damp, 1.50; dry 2.00
Sands, Pa. 2.50
San Francisco, Cal. ..... 3.00@ 3.50
St. Mary's, Pa. 2.25
Thayers, Pa. ..... 2.00@ 2.50
Utica, Ill. ..... 1.25@ 1.50
Zanesville, Ohio ..... 2.00@ 2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast 3.75
Molding fine and brass molding 2.50
Molding coarse 1.75
Allentown, Pa.—Core and molding fine ..... 1.50@1.75
Arenzville and Greenville, Ill.—Molding fine ..... 1.50@1.60
Molding coarse ..... 1.50@1.75
Brass molding 2.00
Beach City, O.—Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse ..... 2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse 5.00
Sand blast ..... 5.00@8.00
Stone sawing 6.00
Cleveland, O.—Molding coarse ..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, Ohio—Core ..... .50@2.00
Sand blast ..... 3.50@5.00
Furnace lining ..... 2.50@3.00
Molding fine ..... 2.00@2.50
Molding coarse ..... 1.75@2.00
Traction ..... .75@ .90
Brass molding ..... 2.00@3.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	**.75**	**.75**	**.75**	**.60**	**.60**	**.60**
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	**1.10**	**.95**			**.85**	
Erie, Pa.		.60	.90		1.00	
Farmingdale, N. J.	.48	.48	1.00	1.00	1.20	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		**.50**	**1.75**	**1.35**	**1.35**	**1.25**
Machias, N. Y.	.95	.95	1.25	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.00	.70	.70	.70
Portland, Maine		**.50**	**1.75**		**1.35**	**1.35**
Washington, D. C. (rewashed, river)	**.75**	**.75**	**1.60**	**1.40**	**1.20**	**1.20**
CENTRAL:						
Alton, Ill.		**.85**				
Anson, Wis.	.50	.40				.90
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		**.70**			**.80**	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	**.70**	**.65**	**.90**	**.90**	**.90**	**.90**
Columbus, Ohio	.75	.75@1.00	.65@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.60	.60	1.70	1.70	1.70	1.70
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	**.70**		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	40@ .50	.45	1.25			.90
Elkhart Lake, Wis.		.50			.60	.60
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		**.50**		**.80**		**.70**
Greenville, Mechanicsburg, O.	**.65**	**.65**	**.65**	**.65**	**.65**	**.65**
Hamilton, Ohio		**.90**			**.90**	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.	.40	.40			.70	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Libertyville, Ill.		**.50**		**.70**		
Mankato, Minn.—Pit run	.50	.40	.40			1.25
Mason City, Ia.	.65	.60		1.80	1.70	1.65
Mendota, Ill.	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05	.60@1.05
Milwaukee, Wis.	**1.06**	**1.06**	**1.26**	**1.26**	**1.26**	
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.70	.70	1.40	1.40	1.40	1.40
Riton, Wis.		.60			.80	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		1.45
St. Louis, Mo., delivered on job	**2.05**	**2.20**	**2.35**	**2.15**		**2.10**
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	**1.00**	**1.00**	**1.25**	**1.25**	**1.00**	**1.00**
Waukesha, Wis.	.40	.40	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.25	1.10	1.10
Yorkville, Sheridan, Moronts, Oregon, Ill.	.60	.50@ .70		.60@ .80	.50@ .70	.60
SOUTHERN:						
Alexandria, La.		**.70**			**1.20@1.35**	
Birmingham, Ala.	1.48		all gravel—1.88			
Charleston, W. Va.	1.40		1.50			
Estill Springs, Tenn.	**1.35**	**1.15**		**1.00**	**.85**	**.65**
Ft. Worth, Tex.	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Jackson's Lake, Ala.	.50@ 60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	1.00	1.00@1.50	1.00@1.50	1.00@1.50	1.00@1.50
Lake Weir, Fla.		60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	**1.12**	**1.12**				**1.95**
N. Martinsville, W. Va.		1.00	1.00	1.00	1.00	.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.	.25			.85		
WESTERN:						
Grand Rapids, Wyo.	50	.50	.85	.85	80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*		1.25*		
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.15@1.45
San Francisco, Calif.		1 00	1.00@1 20	.85@1.00	.85@1 00	.85@1 00
Seattle, Wash.	1.00*	1.00*	1.00*	.85*	.85*	1.00*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas						.55
Janesville, Wis.		.65			.65@ .75	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Tex.		.80		1.50		1.30
Winona, Minn.			Clean pit run .60			
York, Pa.		.95@1.10	(crushed rock sand)			

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.85	.80	.80
Erie, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Emporium, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.75	1.50	1.50	1.50	1.50	1.50	1.50
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

EASTERN	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Berkley, R. I.			**12.00**					**2.30**
Buffalo, N. Y.	11.50	10.00	10.00	12.00	8.00	10.00	8.50	1.60
Chaumont, N. Y.					**2.50**	**4.00**		
Lime Ridge, Pa.							**5.00**	
West Rutland, Vt.	13.50	12.00		13.50			10.00	
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		10.50	10.50	12.50			8.50	1.65*
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Delaware, Ohio	11.50	10.00	9.50	10.50			9.00	1.60
Gibsonburg, Ohio	11.50	10.00	10.00		8.00	10.00	7.00	
Huntington, Ind.	11.50	10.00	10.00				8.00	1.70*
Luckey, Ohio	11.50	10.00	10.00					
Marblehead, Ohio	11.50	10.00	10.00		8.00	10.00	8.50	1.60
Marion, Ohio		**10.00**	**10.00**					
Mitchell, Ind.		**12.00**	**12.00**	**12.00**	**11.00**		**10.00**	**1.60**
Sheboygan, Wis.								7.50d
White Rock, Ohio	11.50	10.00	10.00	11.00	8.00	10.00	8.50	1.60
Woodville, O. (dlrs.' price)	11.50a	10.00a	10.00a	11.00a			9.00	1.60
SOUTHERN:								
Erin, Tenn.							**6.00**	**1.00**
El Paso, Tex.							7.00	1.50
Karo, Va.							**7.00**	**1.30**
Knoxville, Tenn.	18.00	11.00@12.00		11.00@12.00	10.00	11.00	8.50	1.50
Ocala and Zuber, Fla.	12.00	11.50	11.50	14.00			**12.00**	**1.60**
Sherwood, Tenn.	12.00	11.00					8.50	1.50
Staunton, Va.					5.00	6.00	8.00	1.40
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	22.00	22.00	15.00	22.00			**16.00**	**2.15•**
Tehachapi, Calif.							13.00	2.10

‡100-lb. sacks; •180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	**1.00**
Molding, fine and coarse	**1.25**
Brass molding	**1.50**
Dunbar, Pa.—Traction, damp	2.25
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	**1.00@1.25**
Sand blast	3.10@3.60
Traction	.30@ .40
Falls Creek, Pa.—Molding, fine and coarse	**1.75**
Sand blast	**2.00**
Traction	**1.75**
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	**2.00**
Molding coarse	**1.75**
Brass molding	**2.00**
Greenville, Ill.—Molding coarse	**1.30@1.50**
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and luting clay	.60@ .80
only)	.70
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Stone sawing	**1.30@1.50**
Klondike, Pacific, Gray Summit, Mo.—Glass sand, furnace lining, molding coarse	2.00@2.50
Molding fine	2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp 2.00, dry	2.75
Massillon, O. — Traction, molding fine and coarse, furnace lining, core	2.75
Brass molding	3.00
Michigan City, Ind.—Core, traction	.40@ .45
Mineral Ridge, Ohio—(Green) core	2.00
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.25@1.35
Traction	1.00
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse	1.50
Oregon, Ill.—Core, furnace lining	1.25@2.00
Sand blast	3.00@4.50
Stone sawing	1.50@3.50
Brass molding	1.25@2.00
Ottawa, Ill.—Core, furnace lining, molding, steel, traction, roofing sand	2.00
Brass molding	3.00
Sand blast	3.50
Stone sawing	3.50
Core and molding coarse (crude)	1.25@1.50
Ottawa, Minn.—All crude silica sand	.75@1.00
Pelzer, S. C.—Glass sand (carload lots	
Rockwood, Mich.—Core, damp	1.90
Roofing	2.75
Sand blast	**3.75**
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60

(All per 2000 lbs.)

Miscellaneous Sands

(Continued)

San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit.	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core	2.00
Furnace lining	1.25
Molding fine and coarse	1.25
Traction	2.00
Utica, Ill.—Core	.75@1.25
Furnace lining	1.00@1.50
Molding fine, dry	1.25@1.50
Molding coarse, crude and dried	.75@1.50
Roofing sand	1.25@1.50
Stone sawing	1.25@2.50
Traction	1.50
Brass molding	1.25@1.50
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O. — Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.25
Traction, brass molding (dry)	2.00
Zanesville, Ohio—Core	2.00
Furnace lining	6.00
Molding fine	2.75
Molding coarse	2.50
Brass molding	3.00

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	12.00
Cubes	50.00
Blanks (per lb.)	.07
Chatsworth, Ga., and Marshall, N. C.—Crude talc	5.00
Ground talc (20-50 mesh), bulk 6.50, bags	7.50
Ground talc (150-200 mesh), bulk 7.50@9.50, bags	8.50@12.50
Pencils and steel workers' crayons (gross)	1.50@ 2.50
Chester, Vt.—Crude talc	5.00
Ground talc (150-200 mesh), bulk	6.50@ 8.50
Emeryville, N. Y.—200-325 mesh; bags	14.75
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.00@ 3.50
Ground talc (20-50 mesh)	6.75@ 7.75
(150-200 mesh) bags	9.00@14.00
Johnson, Vt. — Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	16.00@20.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.50, bags	5.50
(150-200 mesh); bulk 6.50, bags	7.50
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt. — Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%-72%	4.50@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	**7.00**
Mt. Pleasant, Tenn. — Analysis, .70 B.P.L. (2000 lbs.)	6.50
Montpelier, Idaho—70% B.P.L.—Crude	4.75
Crushed 2-in. ring and dried	5.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	3.60

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. Ton	
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@8.00
Centerville, Tenn.—B.P.L. 65%	6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65%	5.50@6.00

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	20.00@22.00	16.00@20.00
Slate granules		7.00@ 7.50
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	10.00@12.00	10.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
granite; sacks	28.50@30.00	20.00@22.50
Marble chips, white, pink, creole, black		27.50
green		37.50
sparklets (bags extra)		50.00
Milwaukee, Wis.		20.00@30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	20.00@22.00	16.00@20.00
Piqua, O.—Marble		7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.		10.00@14.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags		
10c extra	5.00	5.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Bellows Falls, Vt.	18.00	25.00@35.00
Birmingham, Ala.	15.00	30.00
Carpenterville, N. J.	20.00	36.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	20.00	32.00
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	18.00	30.00@40.00
Piqua, O.	15.00	25.00
Portland, Ore. (Del'd)	21.00	45.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
Rochester, N. Y.	21.00	
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Seattle, Wash.	22.00	35.00@80.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@14.00	27.00@65.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	10.50
Boston, Mass.	13.00@14.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Grand Rapids, Mich.	11.50
Lancaster, N. Y.	13.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.00
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
f.o.b. cars	14.00
Washington, D. C.	14.50
Winnipeg, Can.	18.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	23.00	13.00
Baltimore, Md.	21.00	15.75
Cincinnati, Ohio	14.80	12.30
Chicago, Ill.	20.00	18.00
Dallas, Tex.	25.00	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	18.00	13.25
Kansas City, Mo.	25.60	24.00
Minneapolis, Minn. (white)	25.50	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.80	13.10
Philadelphia, Pa.	15.50	14.50
St. Louis, Mo.	21.20	19.00
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	.....

	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.25†	1.85†
Baltimore, Md.	.....	15.00‡
Cincinnati, Ohio	.....	10.75‡
Chicago, Ill.	1.50†	1.40†
Dallas, Tex.	15.00‡	11.00‡
Denver, Colo.	.....	2.70†
Detroit, Mich.	.....	17.00‡
Kansas City, Mo.	2.34†	2.20†
Minneapolis, Minn.	1.70†	1.40†
Montreal	15.00‡	11.00‡
New Orleans, La.	2.40†	.....
New York, N. Y.	3.63½*	2.75@3.13½*
Philadelphia, Pa.	13.00‡	12.00‡
St. Louis, Mo.	.....	17.75‡
San Francisco, Calif.	.....	1.75†
Seattle, Wash.	2.80†	.....

*Per 280 lb. bbl. (net). †Per 180-lb. bbl. (net). ‡Per ton. Refund of 10c per bbl. Minneapolis quotes brown common lump lime: Kelly Island white is $1.55, Sheboygan $1.45. New York quotes hydrated lime "on cars" in paper sacks; lump lime "alongside dealers' docks" or "on cars."

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga.	2.80
Boston, Mass.	3.03
Cedar Rapids, Iowa	2.45
Cincinnati, Ohio	2.51
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Tex.	2.25
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.47
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.45
Los Angeles, Calif.	3.00
Milwaukee, Wis.	2.37
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.83
New York, N. Y.	2.70
Pittsburgh, Pa.	2.24
Portland, Ore.	3.05
St. Louis, Mo.	2.35
San Francisco, Calif.	2.63
St. Paul, Minn.	2.39
Toledo, Ohio	2.48
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	.....	5.00	7.50	8.50	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	7.00	10.00	10.00	10.00	.....	.....	31.05	.....	20.00	21.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	12.00	12.50	.....	.....	33.75	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

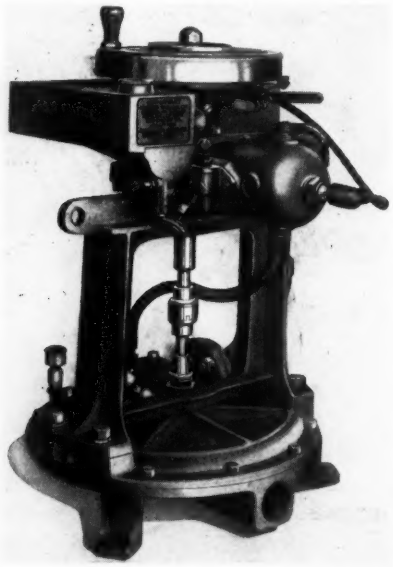
NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

New Machinery and Equipment

A High Capacity Portable Pump

SINCE the first day that rain poured into a quarry or pit the need has existed for a light high-capacity portable pump. Such a pump has been designed and is now being manufactured by the Evinrude Motor Co., Milwaukee, Wis., known as the Evinrude unit centrifugal pump.

This pump, weighing 115 lb., can be readily handled by one or two men. It consists of two main parts, the pump proper and the motor. As the pump is direct driven by the motor thus eliminating gears, chains or belts, the maximum amount of energy generated by the motor is used to pump. This pump has but one moving part, the impeller, thus it can pump thick and gritty materials. The impeller is mounted in a casing to which is bolted the bracket or stand which holds the motor.



This small centrifugal pump raises 5000 gal. per hour under a 20-ft. head

The motor is the standard boat type manufactured by the Evinrude company. The ignition is furnished by a magneto built into the flywheel where it is insulated and protected against water.

Unless a permanent installation is desired, it is not necessary to secure the pump to anything solid as it may be lowered by rope or cable into a hole and will pump while suspended. It may also be placed on the ground without being fastened. Where it is desired to use the pump in a narrow ditch or hole too small to accommodate a man, the pump can be started before it is lowered into the hole. Where a permanent installation is desired, the floor space required is 16½x23-in. for the 2-hp. size. One filling of the fuel tank runs the motor from three to four hours and as the lubricating oil is mixed with the gasoline no oil or grease cups are necessary.

In pumping water, conditions vary greatly. The manufacturers do not claim that their pump can answer all pumping problems, but where portability, high capacity and low cost are the essential requirements, this pump is said to fill the need. The pump is made in two sizes 2 and 3½ hp. The 2-hp. size has a capacity of 5000 gal. per hour under a head of 20 ft., while the 3½-hp. size pumps 7400 gal. under the same conditions.

New Screen with Gyratory Hand Sieve Motion

THE new Rotex compact sifter for screening materials from 2 to 300 mesh, manufactured by the Orrville Simpson Co., Cincinnati, Ohio, has for its basic feature a series of suitably arranged inclined surfaces for causing many small balls to be thrown upward against the underside of the nearly level gyrating sieve fabric. Fig. 1 shows this feature of the screen.

How the pump may be suspended by rope into a small hole

The sifting cloth or fabric is shown at A, while B is the coarser ball-supporting screen. The ball C, flying about under the rotating action of the screen, flies against the inclined surface D and is deflected upward, hitting the sifting fabric, thus causing the material to screen through. This principle, claims the manufacturers, has worked effectively on many materials—lime, filler's earth, phosphate, rock,

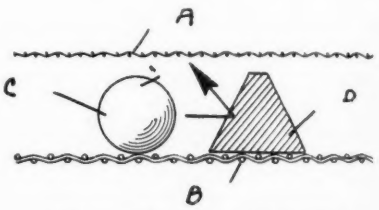


Fig. 1—Diagram of the screen

magnesite, silica, ground slate, etc.—under conditions varying from bone dry to semi-liquid.

Fig. 2, a vertical view of the device, shows how the hand-shaking motion is applied.

This gyratory motion floats off light particles of foreign matter and causes the fine material—which is heavier than the coarse per unit of volume, to sink down and pass through readily.

As soft, sticky or fine materials gradually clog up the sieves and necessitate periodic hand brushing, these ball cleaners prevent the gradual closing and insure uniform separations. The action of the ball and strip cleaners is like that of tapping the fingers against the underside of the sieve cloth, but at a rate of 300 or more taps per minute on every square foot of cloth. The balls actually come into direct contact with practically all the screening surface of the cloth.

With most materials the rubber balls in the cleaning system, it is said, last about two years; their replacement is simple. In this system either silk or wire may be used, and although wire is preferable on some materials, silk has its advantages. The cloths need not be drawn up to extreme high tension.

Rotex fabric is of substantially the same mesh as that of the small laboratory hand sieve. This screen is not troubled with large percentages of oversize in the "throughs." The sieve frames can be changed in three minutes' time without

tools, and the entire sieve can be inspected while running, through doors in the top cover.

A self-aligning S. K. F. ball-bearing of ample proportions is used in the crank socket, four other ball bearings carrying the balance wheel and the pulley shaft. A liberal use of ball bearings saves power and avoids shutdowns due to hot box and seizing or a loose bearing. The power consumed by No. 7 will not exceed 1 hp. on average work.

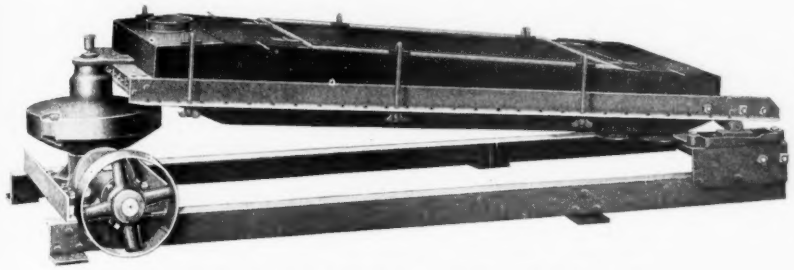


Fig. 2—How the hand-shaking motion is applied

This screen is quiet in operation except for a low rumble from the ball cleaners. The bevel friction drives with a rolling motion, and good contact is insured by the heavy weight of the balance wheel bearing down on top of the friction, no springs being used. The screen is dust-tight. The top cover material on Nos. 3 and 7 is similar to that used in automobile tops.

The metal box and base frame is securely riveted. There is one sieve which makes two separations in the "overtails" and the "throughs." The reversible sieve frame enables the operator to equalize the wear and prolong the life of the cloth. The top cover and screen are removable by loosening 10 wing nuts. The inspection doors can be opened and cleaned while the screen is running.

New Features on Revolving Steam Shovel

THE Marion Steam Shovel Co., Marion, Ohio, has recently announced a number of new features on its Model 21, ¾-yd. revolving shovel. One of the most important features is a new type of rigid crawler trucks. The power steering arrangement is controlled by the operator without outside assistance. A handy lever, arranged at operator's station immediately back of the three main levers, is connected to movable arms on the underside of the rotating frame which when engaged align with similar arms projecting upwards from the lower frame and operate the clutches on the driving axle.

Steering is accomplished by swinging the upper frame and the shovel can be turned in a circle 18 ft. 8 in. in diameter. All clutches may be disengaged and the shovel towed with ease.

The four belt flexible type of trucks can also be furnished; these trucks are desirable, for they can negotiate practically any kind of ground with a minimum of tipping and rocking of the shovel. Other mountings include traction wheels with either steel or rubber rims and railroad wheels for standard or narrow-gage track.

The dipper front is a single manganese steel casting of the same design and proportionately the same strength as the larger machines. Bevel propelling gears and shipper pinions are also made of manganese steel.

The boiler tubes are electrically welded to top and bottom tube sheets, thus sealing the ends against leakage. The boiler is fed with a duplex pump and injector and every appliance provided for safe and efficient operation.

The New 21 is readily converted into a dragline, clamshell and orange-peel excavator or into a material handling crane. When long reach and high dump are required high lift equipment can be supplied.

THE OFFICIAL PROGRAM of the National Crushed Stone Association is on pages 20, 21.

New Industrial Trailer

THE constantly increasing use of the Fordson tractor in commercial hauling and other industrial work has created a demand for special hauling equipment designed to be used with it, says the Miami Trailer Co., Troy, Ohio, in announcing a new special Miami Fordson trailer.

This trailer is of all steel construction except wheels and tires, has a rounded load capacity of 2 yd. with provision for mounting a separate flared top box of ½-yd. or 1-yd. extra capacity for transporting materials of a total load of 2½ tons, but of greater volume that 2 cu. yd. With ample factor of safety the carrying capacity is 2½ tons.

The entire load dumps back of the axle and behind the wheels of the trailer.

Several new features of this new type of revolving shovel are shown here

Both release and winding levers are placed at the driver's right hand. This eliminates the necessity of stopping to dump or spread the load or to rewind the dumping door; such flexibility of operation greatly reduces ton mile costs.

The turning radius is that of the Fordson tractor. The unit can be backed into any position or can be turned around easily on the sub-base of a road. This flexibility is important for operation in close places.

While designed to be used with the Fordson tractor, it is equally well adapted for use with all other tractors with a drawbar rating similar to the Fordson. It can also be employed with 2½- and 3-ton high-speed trucks.

News of All the Industry

Incorporations

The Ventura County Lime and Fertilizer Co., Santa Paula, Calif., has been incorporated for $200,000.

The Eyre Gravel Co., Seattle, Wash., has been incorporated for $200,000 by E. G. Helgessen, A. C. Peters and R. H. Evans.

F. E. Waite has been incorporated for $12,000 to operate a quarry at Albany, N. Y., by F. E. Waite, P. E. McCabe and A. Bran.

The Fort Worth Sand and Gravel Co., Inc., Fort Worth, Texas, has been incorporated for $200,000 by R. M. Quigley, H. P. Bonner and J. C. Hart.

The Quality Sand and Gravel Co., Springville, N. Y., has been incorporated for $100,000 by D. H. Ames, Franklinville, N. Y., S. G. Engel and P. W. King.

The Lake Weir Crystal Sand Co., Ocala, Fla., has been incorporated for $25,000. Nathan Mayo is president, L. W. Duval, vice-president and D. B. Mayo, secretary and treasurer.

The Detroit Gravel Co. has been granted articles of incorporation by the secretary of state of Michigan to the amount of $1,250,000. The incorporators are F. D. Coppock, C. E. Patty, G. C. Baker, H. R. Brown, J. F. Coppock and J. Patty, representing the Greenville Gravel Co. interests, and C. R. Talbot, vice-president of the National Bank of Commerce of Detroit; John Koenig, president P. Koenig Coal Co., Detroit, and G. B. Yerkes, senior member of Yerkes, Simon and Goddard, Detroit. The new corporation has taken over several gravel operations in the Detroit territory and expect to expand still further in the gravel business in Michigan.

Quarries

El Paso, Texas—J. J. Watkins has opened a rock quarry near High Rolls, N. M.

The Public Service Co., Newark, N. J., plans developing a quarry at Granite, N. C.

The National Soapstone Co., Roanoke, Va., has increased its capital stock to $250,000. W. G. Jones is president.

The Alexander Granite and Land Co., Statesville, N. C., has increased its capital to $250,000 and is building six miles of railroad. J. W. Deaton is president.

The White Rock Quarries, Bellefonte, Pa., at its regular meeting of directors declared a 3 per cent dividend to the stockholders, payable December 1.

The Amalgamated Co., Arco, Idaho, closed its lime rock quarry for the season and will reopen it in the spring. In the meantime repairs will be made. Mr. McPherson is superintendent.

Harry S. Kramer, 504 North 24th street, East St. Louis, contemplates forming a quarry company and opening a plant in the near future. The new company will specialize in crushed rock.

The Lehigh Stone Quarry, Kankakee, Ill., will be closed until next spring. The 100 workmen will not be discharged, but will be employed repairing machinery and other work for the winter.

Cement

The St. Paul Cement Stone Co., St. Paul, Minn., has let the contract for the erection of a concrete factory.

The Petoskey Portland Cement Co., Petoskey, Mich., is reported to be contemplating a $500,000 expansion of plant.

The Louisville Cement Co. announces that a post office has been established at Speed, Ind., and all future mill correspondence should be addressed to Speed, Ind., instead of Sellersburg, Ind.

Hays, Kans.—The Lamborn Cement Co., California, will establish a plant on the west coast of Mexico. Mr. Mead, an official of the company, is at the Hotel Regis, getting things in shape with the authorities.

The Georgia Cement and Stone Co., Portland, Ga., has been incorporated with a $5,000,000 authorized capital to manufacture portland cement, crushed rock, etc., by G. E. Nicholson, G. A. Nicholson and R. E. Nicholson.

The Olympic Portland Cement Co., Bellingham, Wash., will have produced between 450,000 and 500,000 bbls. of cement by the end of the year. The November shipments totaled 8,000 to 10,000 bbls. a week.

Amarillo, Texas—A cement products manufacturing plant may be erected here, according to E. T. Morton, official of the Portland Cement Association, who has been making investigations of sand and gravel beds near the city.

The Universal Portland Cement Co., Duluth, Minn., will make improvements estimated to cost $532,000 and the company's cement mill No. 7 will undergo expansions, including improvements of the coal grinding, building and finishing mill, burner mill extensions and new raw material mill. Extensions to present buildings will have concrete foundations, steel frames with corrugated iron roof and sides.

The Linwood Stone and Cement Co., Davenport and Linwood, Iowa, has filed amended articles of incorporation to increase its capital to $2,000,000. According to the amended form of articles the company will operate cement plants, quarries for the production of stone, stone dust, etc., and will deal in all kinds of building material. Officers are: A. E. Horst, president; A. E. Carroll, first vice-president; C. C. Hagerman, second vice-president; Otto Hill, treasurer, and J. F. Schroeder, secretary and general manager.

Lime

The Utica Lime Co., Seymour, Ind., has increased its capital from $10,000 to $35,000.

The Lime and Stone Co., Hamberg, N. J., will electrify its properties in this district and install motors and other equipment. Power will be furnished by the New Jersey Power and Light Co., Dover.

The Dorchester Fertilizer and Lime Co., Cambridge, Md., is planning for the installation of a complete grinding mill and auxiliary equipment with capacity of about 60 tons per day. Lloyd Webster is president.

The Gager Lime and Manufacturing Co., Chattanooga, Tenn., is planning the installation of additional equipment, including disc crusher, stone washer of 200 tons capacity, operating equipment and other mechanical apparatus. M. P. Kennedy is secretary.

The Hagerstown Lime and Chemical Co., Hagerstown, Md., has been incorporated for $30,000 and will engage in the manufacture of agricultural lime and chicken grit. Buildings will be erected and new machinery installed of such character that objectionable fumes will be carried off. Incorporators are J. S. Myers, W. R. Moler and Enos Kitzmiller.

Concrete Products

Kelso, Wash.—The Concrete Pipe Co. has completed arrangements for the establishment of a plant at Longview, west of Kelso.

The Samson Granite Co., Tenafly, N. J., has been incorporated for $125,000 to manufacture concrete products. Incorporators are W. Dahm, G. W. Dahm, A. Dahm, North Bergen, N. J.; C. C. Keiler, West New York.

The Concrete Products Co., successor to the Birmingham Roof, Tile and Supply Co., recently shipped a large order of concrete tiling to Anniston, Ala. This company also manufactures a line of concrete boxes and lawn furniture, all cast from concrete.

The Terre Haute Duntile Co., Terre Haute, Ind., has been incorporated for $50,000 to manufacture concrete products. Incorporators are D. R. Ulmer, C. J. Eberly, D. H. Whitaker and H. E. Craver. The company will erect a modern factory.

Sand and Gravel

The Morgan Sand and Gravel Co., Brooklyn, N. Y., has increased its capital from $25,000 to $50,000.

Loogootee, Ind.—The Burress Gravel pit near Peek Curve is working full time now and is shipping gravel to be used on Daviess county roads.

The Pittsburgh Plate Glass Co.'s new plant at Zanesville, Ohio, was designed and constructed by J. C. Buckbee Co., consulting engineers, Chicago.

Terre Haute, Ind.—The Summit Sand and Gravel Co. has filed with the secretary of state a notice to increase its stock from $10,000 to $100,000.

The Leesburg Sand and Supply Co., Leesburg, Fla., has been organized to handle the waste sand at the Lake County Clay Co.'s kaolin mines at Okahumpka.

The Pensacola Gravel Co., Pensacola, Fla., is developing sand pits with a daily capacity of from four to six cars a day. Leon Jones, Walnut Hill, is secretary.

The Turner Gravel Co., recently incorporated in San Antonio, Texas, has filed an amendment to its charter increasing its capital stock from $50,000 to $150,000.

Warrenton, Mo.—Dr. McNay and Robert Feszold, Pacific, have purchased 20 acres of land from the Hercules Powder Co. and have started a sand plant on the Missouri Pacific railroad.

The Tulsa Sand Co., Pawnee, Okla., has installed a large sand dredging plant north of Ralston. The plant will handle 20 cars daily. Mr. Ratcliff, Ralston, is in charge of operations.

Woodland, Calif.—$40,000 or more will be expended in developing a commercial gravel pit in Cache Creek by E. F. Alden and B. Borach & Sons, Yolo. A spur track will be constructed to the Southern Pacific railroad.

The Lenawee Sand and Gravel Co., Tecumseh, Mich., is planning to erect a new washed gravel plant, of modern steel construction. A slack line cable excavator will also be installed. The output will be about 20 carloads of gravel per day.

The Grand Haven Sand Co., Grand Haven, Mich., which began operating in October, 1921, reports that up to October of this year a total shipment of 1,974 cars of sand has been removed from its property. At present the company is shipping on an average of 15 to 20 cars a day.

The Belmont Sand and Gravel Co., Belmont, Mich., which was organized last July, is planning to enlarge its operating capacity. More than 11,000 tons of graded sand and gravel has been shipped since operations started. About $100,000 has been invested in plant and equipment and more than $50,000 in Belmont real estate containing an enormous gravel deposit.

Bloomington, Ill.—The McGrath Sand and Gravel Co. announces that its capitalization has been increased to a half million dollars and will build an additional plant at Joliet, Ill. It will then have five plants in Central Illinois. Construction will continue throughout the winter so that it will be completed about March 1. The company has developed in 15 years from one to five plants. The general office is in Lincoln.

Obituary

W. B. Everest, general traffic manager, Westinghouse Electric Mfg. Co., died December 5 at his home in Pittsburgh where he had been confined for one week with pneumonia. Mr. Everest was born July 3, 1868, at Newark, N. J. After completing his high school education he entered the employ of the United States Electric Co., Newark, which was later merged with the Westinghouse Electric and Mfg. Co. While at the Newark Works of the electric company he was chief clerk to the general superintendent. In May, 1884, he was transferred to the East Pittsburgh Works, retaining his position of chief clerk. In 1895 he was transferred to the auditing department, in charge of cost, and was later appointed storekeeper and shipper, and then traffic manager of the East Pittsburgh works. In 1914 he was made general traffic manager.

AMSCO MISSABE DIPPER
at the LEHIGH STONE CO.

Here are two engravings showing the Missable Dipper on the job at the quarry operated by the Lehigh Stone Co., Kankakee, Ill.

The service performance of this dipper has given the user satisfaction that always accompanies the Missabe.

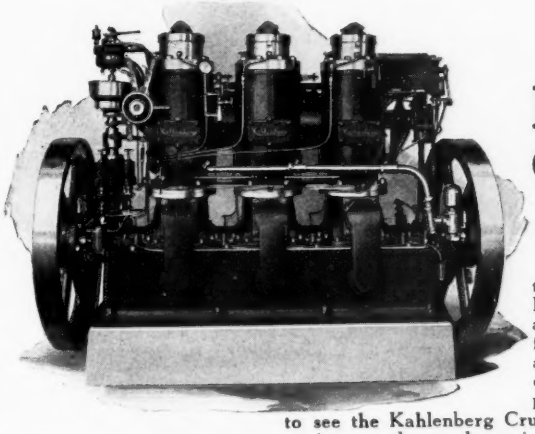
Read what W. R. Sanborn, V. P. & Gen. Mgr., of the company writes:—

"Regarding our opinion as to the service ability of the 3½ yard Missabe Dipper furnished us for our 95-C Bucyrus Shovel.

"We have now completed a full season's work with this dipper and wish to advise that we are very well pleased with its performance and with the minimum maintenance which it has required. The dipper tooth points and bolts are the only parts of this dipper which have needed replacing and it certainly looks as though it should be good for many more seasons of hard work."

AMERICAN MANGANESE STEEL COMPANY
General Sales Offices, 398 E. 14th St., Chicago Heights, Ill.
Foundries, Chicago Heights, Ill.—Newcastle, Del.—Oakland, Cal.

"Kahlenberg Engines Give Satisfaction Everywhere"



Kahlenberg
HEAVY DUTY OIL ENGINES
Sizes 25 to 180 H.P.

News of the New Kahlenberg Crude Oil Engine has spread throughout the Stationary Engine Industry. It did not take long for alert men in every corner of the land to learn that a radical and original engine improvement has been brought forth. Men who have seen the new type Kahlenberg in action have told others—all have agreed that no other crude oil engine has embodied the original features conceived and perfected by Kahlenberg. For this reason, we want you also to see the Kahlenberg Crude Oil Engine, note its convenience and smoothness in action, when running at any speed, no load, or full load. Note particularly that it idles all day without skipping and takes up full load without shock or jar instantly, and without special devices of any kind—it is built that way.

Note these original features:

Patented—Governor control.
Patented—Injection control.
Patented—Air starting and reversing.
Patented—Water cooled combustion chamber.
Patented—Pressure fuel oil strainer.
Every part "getatable" and removable.
Guaranteed to operate perfectly on any of the crude fuel oils or kerosene.

May we send you a catalogue?

KAHLENBERG BROS. CO.
Manufacturers
1720 12th St., Two Rivers, Wis., U. S. A.

Kahlenberg engines are very simple and easily operated by any man of ordinary intelligence — no valves to regulate, no high pressure air — automatic regulation and lubrication throughout.

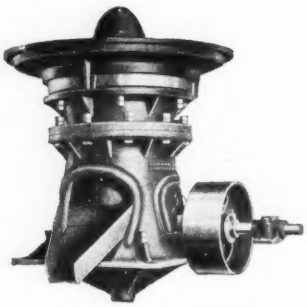
AUSTIN GYRATORY CRUSHERS

Stationary and Portable Types

Austin equipment in your crushing plant will solve your most difficult production problems. Austin Crushers have features found in no others, while Austin Elevators, Screens, Cars and other accessories are in a class with the crushers.

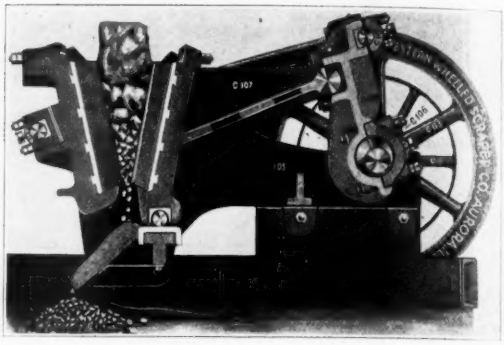
Maximum output with minimum delay is the combination responsible for the remarkable operating records made by Austin equipped plants.

Crusher Catalog 29-T tells the whole story. Drop us a card and we'll send you one by return mail.



AUSTIN MANUFACTURING CO.

New York Chicago San Francisco



WESTERN - AURORA

The Jaw Crusher That is Different

Different in design. Look at the sectional view. Not a time-wasting spring to break, or toggle to fall out.

Also—and what is even more important—a continuous double-stroke crushing motion which increases capacity, reduces vibration and economizes power.

The Western-Aurora Crusher is different in many ways that serve to speed up the work and fatten your pocketbook; and other units of the complete crushing and screening plant are on a par with it. Elevator, screen and bin—all are of the most substantial construction.

A Western-Aurora Crushing Plant is a mighty fine investment from every angle.

Other reasons are found in Catalog 44-T. We would like to send you a copy

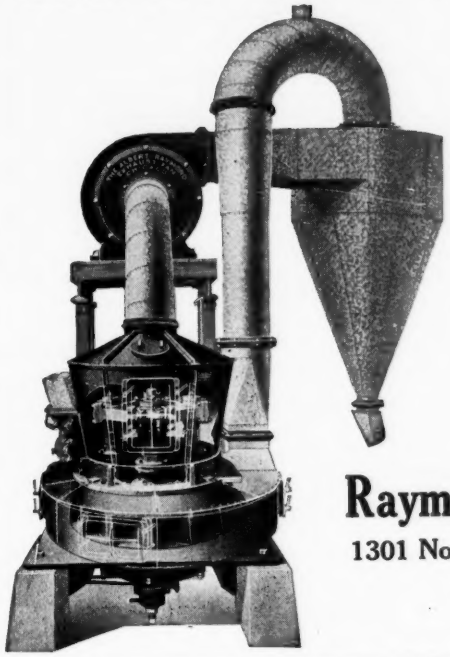
THE AUSTIN-WESTERN ROAD MACHINERY CO.

Chicago, Illinois

Branches in 22 Cities

"Everything from a Drag Scraper to a Road Roller"

Ford Has Six Raymond Roller Mills Grinding Coal for Use in His Large New Boiler Plant



Now, based upon results obtained for a year and a half on these Mills, he will use two more in his new cement plant, besides doubling the capacity of his boiler plant.

Pretty good evidence that Raymond Roller Mills grind coal economically and give continuous day in and day out service.

□

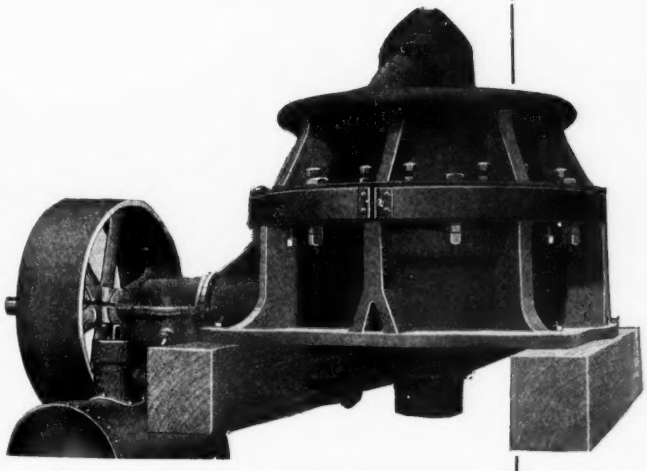
Raymond Bros. Impact Pulverizer Company

1301 North Branch Street Chicago, Ill.

Western Office: 1002 Washington Bldg., Los Angeles, Calif.
Eastern Office: 50 Church St., New York City

TELSMITH REDUCTION CRUSHER

—A Summary



Designed specially for re-crushing service.

Has a big, open hopper, taking coarse, unregulated gravity feed.

Discharges by gravity without centrifugal action.

Effects a big ratio of reduction.

Makes a uniform product.

Delivers an enormous capacity.

The crushing parts wear uniformly.

Low power consumption—cheap maintenance.

It's a regular he-crusher.

Users generally call it the "rock hog."

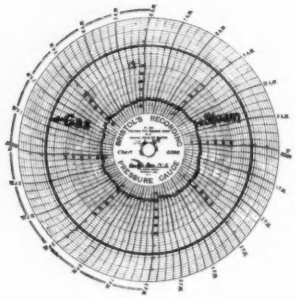
Glad to send you Bulletin 2F11 (Telsmith Reduction Crusher) or Catalog No. 166 (Telsmith Primary Breaker).

No obligation.

Smith Engineering Works

3188 Locust St., Milwaukee, Wis.

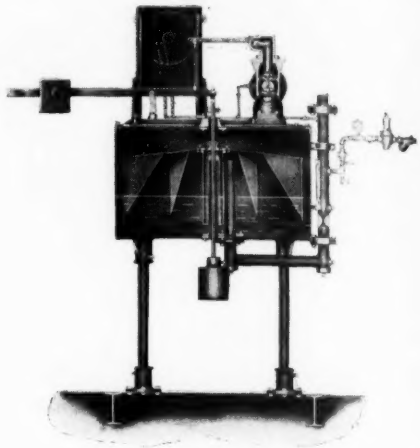
Lime Plant Operators—



This chart shows the even pressure maintained at the Rockland-Rockport plant. The chart was made during the first week of its installation.

The quality of lime does not always depend on the stone used; more often the character of the product is reflected by conditions governing kiln operations.

For instance, the use of the Chowning Regulator by the Rockland-Rockport Lime Corporation, enables this organization to burn their lime right — to get constant, uniform and reliable results, economically.



Sectional View of Chowning Regulator

The function of this regulator is to control the quantity of gas generated in the producer, to meet actual requirements. This is accomplished by regulating the quantity of steam admitted to the gas producer by the gas pressure; resulting in a uniform pressure in the gas main to the furnace.

The first installation of the Chowning Regulator in a lime burning plant was made at the Rockland-Rockport plant, where it is "making good" every claim we have made.

CHOWNING REGULATOR CORPORATION
Corning, N. Y.

Just to Show the Sturdy Construction of Vulcan Rotary Kilns

The installation is the Western States Portland Cement Company, Independence, Kansas. They operate four 9′x0″x175′0″ two-tire Vulcan Rotary Kilns.

The tire and roller bearing supports under the tire, together with thrust roller bearings, are seen in the illustration. In front of the tire is the Girth gear with driving gear train. These are encased in steel plate gear-guards.

We will be pleased to go into further details of Vulcan Rotary Kiln construction; also to have our engineers work with you in your individual problems relating to kilns.

When you're interested in Kilns, write Vulcan

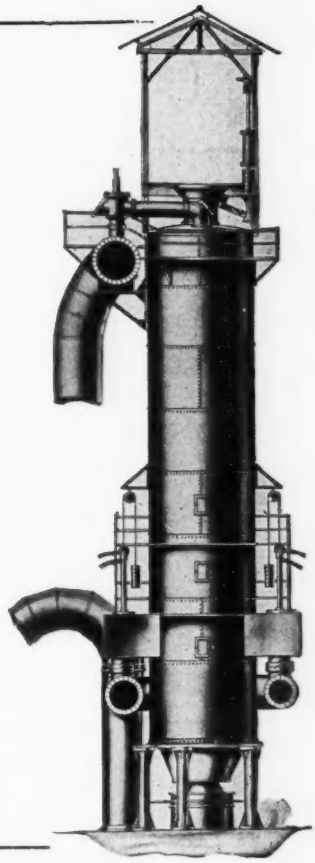
VULCAN IRON WORKS, Established 1849
1753 Main Street **Wilkes-Barre, Pa.**

Continuous Discharge—Gas Fired

LIME KILNS

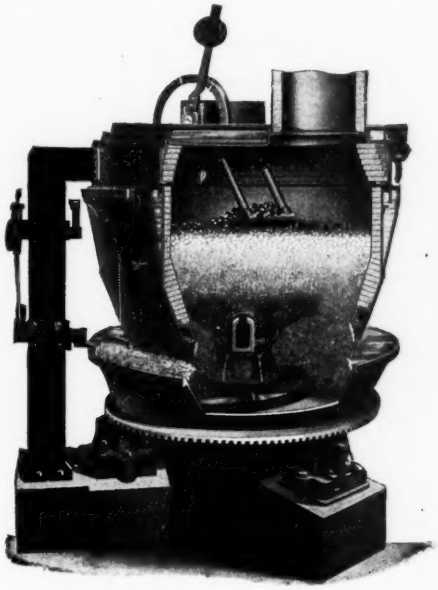
The wastefulness of efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.



Glamorgan Pipe & Foundry Company
Lynchburg, Va., U. S. A.
Using the Nationally Famous Virginia Foundry Irons

The Machine of Absolute Satisfaction



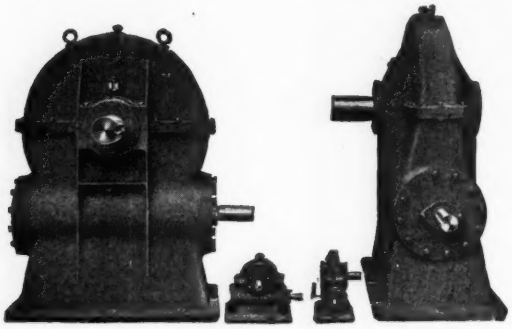
Selected by every large purchaser in the steel industry since the armistice. Three recent installations at leading Eastern Lime Plants.

POKERLESS PRODUCER-GAS MACHINE

Users everywhere testify with one voice to the superior satisfaction and low maintenance expense of this splendid machine. Difference in first cost comes back annually; every detail built for endurance.

MORGAN CONSTRUCTION CO.
Worcester, Mass.
Pittsburgh Office 704 Arrott Bldg. Telephone Court 1381

Cleveland
WORM GEAR REDUCTION UNITS



This illustration, from actual photographs of units side by side, indicates the wide range of sizes available

Built to fit the task

The Cleveland line of speed reduction units includes sizes to meet nearly all requirements. Yet we have no "stock" sizes because each unit is built to meet the precise needs of the job for which it is required.

Briefly, our line includes speed reduction units from 1 H.P. to 400 H.P.

Our single-type speed reduction units handle gear ratios as high as 100 to 1 or as low as 3⅝ to 1 in the smaller drives.

Cleveland double reduction units, such as we have furnished to steel mills, rubber plants, etc., can handle ratios as high as 2000 to 1.

We emphasize the flexibility, strength, simplicity and low maintenance cost of our drives and invite attention to their advantages of compactness, evenness of torque and high efficiency.

We are always glad to co-operate with engineering departments who desire to utilize our specialized experience and information on the subject of speed reduction. Write us.

The Cleveland Worm & Gear Co.
America's Worm Gear Specialists
CLEVELAND, OHIO

DRAVO-DOYLE COMPANY, Pittsburgh
Cleveland, Indianapolis, Philadelphia, New York

New England Representatives
FRANKLIN MACHINE CO.....Providence, R. I.
Pacific Coast Representatives
ALFRED H. COATES CO.....San Francisco, Cal.
Rocky Mountain States Representatives
THE VULCAN IRON WORKS CO.....Denver, Colo.

ATLAS EXPLOSIVES
USED ON BIG JOBS EVERYWHERE

The blaster who uses Atlas Ammite is not only SAVED the inconvenience of thawing required when ordinary explosives are used in freezing weather, but he also is IMMUNE from the headache tortures that result from handling large quantities of the ordinary forms of high explosives. Tell us what explosive you now are using and we will tell you what grade of Atlas Ammite will do YOUR work.

ATLAS POWDER COMPANY
WILMINGTON, DEL.

Branch Offices:—Allentown, Pa.; Birmingham, Ala.; Boston; Chicago; Houghton, Mich.; Joplin, Mo.; Kansas City; Knoxville; McAlester, Okla.; Mexico City, Mexico; New Orleans; New York; Philadelphia; Pittsburg, Kan.; Pittsburgh, Pa.; Pottsville, Pa.; St. Louis; Wilkes-Barre.

Send it Safely—Ship in Steel

DMC
Reg. U. S. Pat. Off.

No. 12 Light Shipping Steel Barrel

Serving the Lime Field

For one year we have been offering the lime and cement field the services of the Draper Steel Barrel. Results have so far justified our efforts that we feel impelled to say to every producer that the advent of our steel barrel in this field has marked an epoch in the shipping of rock products.

If you are not using Draper Steel Barrel Service get in touch with our sales department

"What the Shipper Puts In the Customer Takes Out"

THE DRAPER MFG. CO.

8906 Crane Ave. **Cleveland, Ohio**

Our No. 8 Catalogue Just Fits Your Pocket

District Sales Offices:

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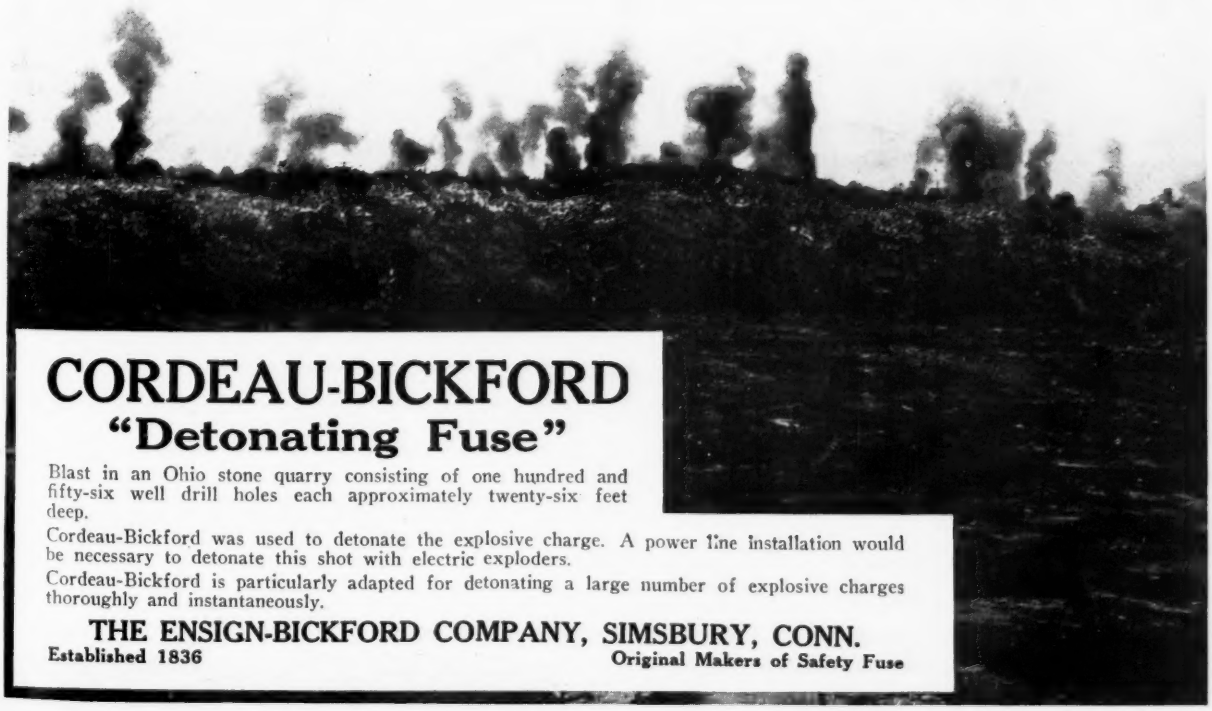
New York—110 William St.; C. B. Peters Co., Inc., Eastern Sales Representative
Chicago, Ill.—128 N. Wells St.; Amco Sales Corporation.
San Francisco, Cal.—16 California St.; The Hale Co.



CORDEAU-BICKFORD
"Detonating Fuse"

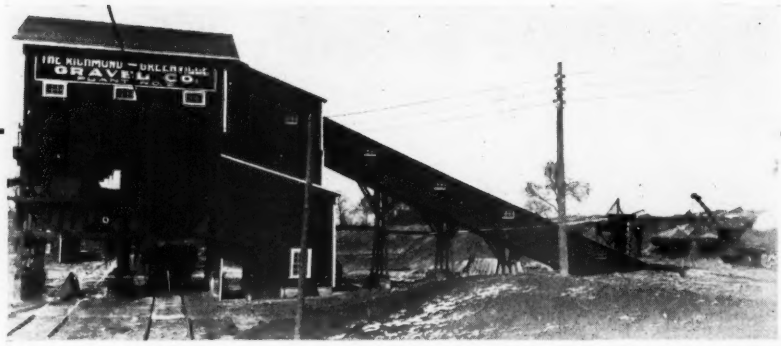
Blast in an Ohio stone quarry consisting of one hundred and fifty-six well drill holes each approximately twenty-six feet deep.

Cordeau-Bickford was used to detonate the explosive charge. A power line installation would be necessary to detonate this shot with electric exploders.

Cordeau-Bickford is particularly adapted for detonating a large number of explosive charges thoroughly and instantaneously.

THE ENSIGN-BICKFORD COMPANY, SIMSBURY, CONN.

Established 1836 **Original Makers of Safety Fuse**



"Our Experience Costs You Nothing"

The Greenville Mfg. Co. is the manufacturing and maintenance department of the Greenville Gravel Co., who operate a dozen large sand and gravel washing plants and have been in the *business for 21 years.*

The equipment manufactured by us is built to withstand the most *severe wear and tear* found only in handling gravel.

Our designs are the result of long experience in *reducing costs, increasing output,* and *improving products.*

Under no other conditions could such *efficiency* be obtained.

Let us figure on your requirements and share with you the results of our experience. **Write** for our catalog.

WE MANUFACTURE

- Bin Gates
- Automatic Feeders
- All types of Screens
- Transmission Machinery
- Complete Belt Conveyors
- Complete Bucket Elevators
- Automatic Sand Settling Tanks

The Greenville Mfg. Co.

"Specialists in Sand and Gravel Plant Equipment"
GREENVILLE, OHIO

WELLER-MADE EQUIPMENT

For Handling the Materials Mechanically

Increase the Output and Reduce Costs by Employing Weller-Made Machinery to Do the Work

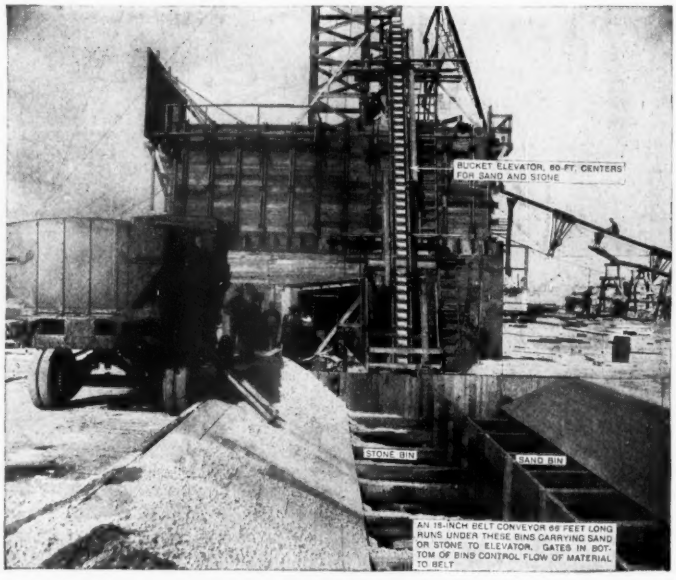
It is sturdy and reliable. Never lays down on the job. The cost of operation is small. Will help pay dividends.

We Make
Conveyors of All Types

Bucket Elevators	**Portable Elevators**
Steel Storage Bins	**Bin Gates**
Screens	**Sheet Metalwork, etc.**

WELLER MADE CHICAGO

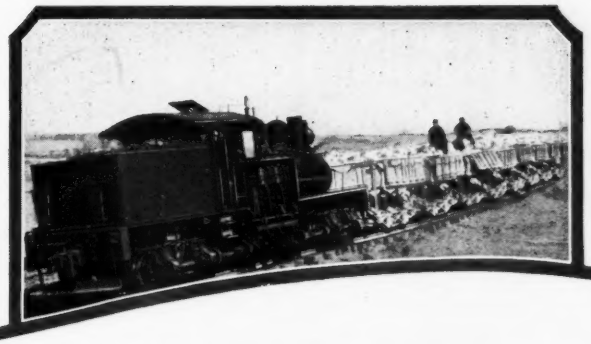
Write and let us know the kind of equipment you are interested in or the material you want to handle. Catalogues showing installations, also data to help in selection of equipment, will be sent.


BUCKET ELEVATOR, 80-FT. CENTERS FOR SAND AND STONE
STONE BIN
SAND BIN
AN 18-INCH BELT CONVEYOR 65 FEET LONG RUNS UNDER THESE BINS CARRYING SAND OR STONE TO ELEVATOR. GATES IN BOTTOM OF BINS CONTROL FLOW OF MATERIAL TO BELT.

WELLER MFG. CO.

1820-1856 North Kostner Avenue **SALES OFFICES** **Chicago, Illinois**

New York **Boston** **Baltimore** **Pittsburgh** **Cleveland** **San Francisco** **Salt Lake City**



AN INVESTIGATION THAT WILL REPAY YOU

LOOK into the Shay Geared Locomotive. Study it from every angle.

Investigate the distinctive advantages of the Shay—the powerful three cylinder engine, the all-wheel drive, the flexible driving shaft and evenly-distributed wheel loads which enable a Shay to operate on lighter track and to take curves that a rod engine would destroy.

To learn what Shays are doing under conditions like yours, give us an outline of your hauling conditions, particularly grades, curves, length of hauls, etc. A request for this information places you under no obligation.

LIMA LOCOMOTIVE WORKS, Incorporated
17 East 42nd Street, New York Lima, Ohio

You can DOUBLE Your Mucking Crew without adding a penny to your payroll!

Mine production sheets tell the story of the remarkable economy in using Hoar "BABY" Shovels in place of hand muckers.

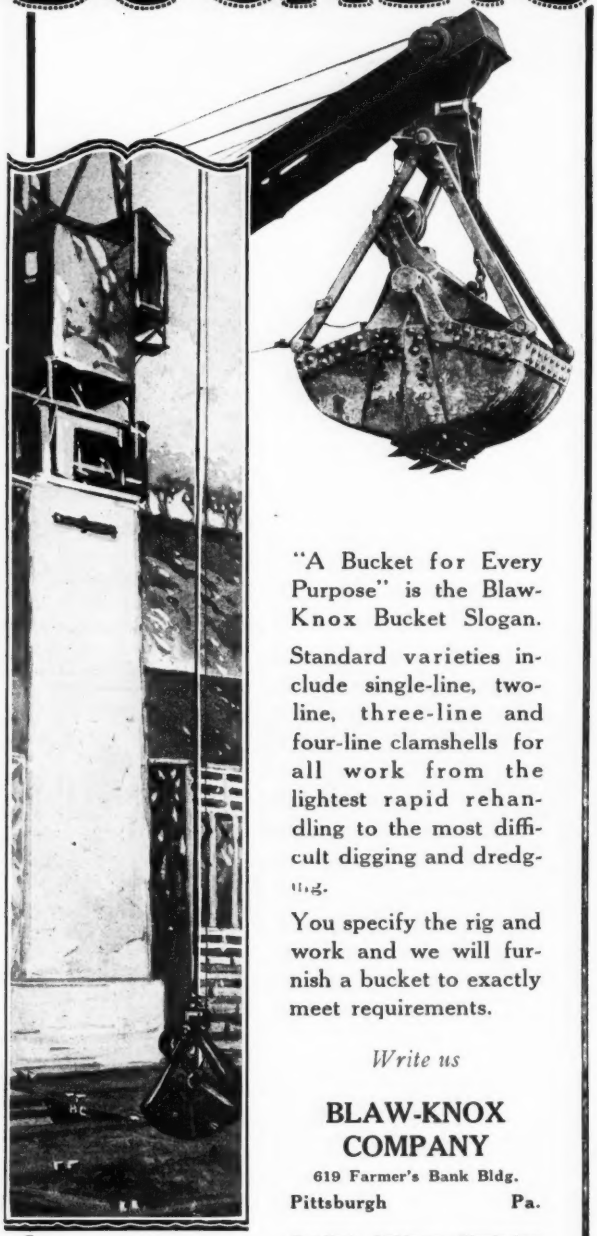
Mucking problems in the handling of Feldspar, Talc, Limestone, Crushed Stone, Gypsum, underground or on the surface, are solved with the installation of this equipment.

Write today for complete data, and after receiving details of your workings, we will guarantee a definite daily output and satisfactory operation.

THE HOAR SHOVEL COMPANY, INC.
214 Sellwood Building Duluth, Minnesota

The HOAR "BABY" Steam Shovel

Digging and Re-Handling BUCKETS



"A Bucket for Every Purpose" is the Blaw-Knox Bucket Slogan.

Standard varieties include single-line, two-line, three-line and four-line clamshells for all work from the lightest rapid rehandling to the most difficult digging and dredging.

You specify the rig and work and we will furnish a bucket to exactly meet requirements.

Write us

BLAW-KNOX COMPANY
619 Farmer's Bank Bldg.
Pittsburgh Pa.

New York Baltimore Birmingham
Chicago Detroit London, Eng.

BLAW-KNOX BUCKETS

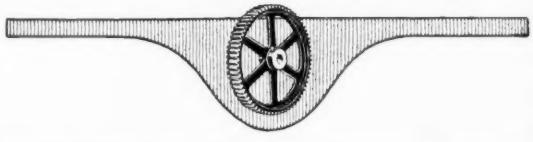
GEARS

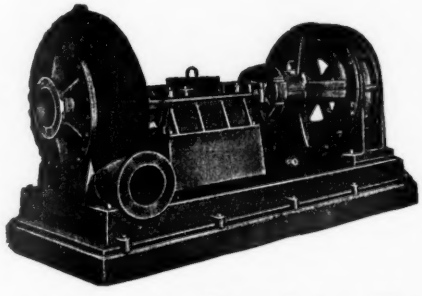
SMOOTH running; correct in design, accurate and true to pitch, Caldwell gears are bound to please you. We make all types—machine-molded, cut tooth, mortise gears, worm gears, etc. Learn more about Caldwell-Link-Belt Service.

Let us figure with you next time you are in the market.

H. W. CALDWELL & SON CO. LINK-BELT COMPANY, OWNER
Dallas, Texas, 709 Main Street—Chicago, 17th Street and Western Ave.—New York, Woolworth Bldg.

CALDWELL





Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4 in. up, arranged for belt, motor, or engine drive.

MORRIS MACHINE WORKS
50 Genesee St. Baldwinsville, N. Y.

39 Cortlandt St., New York City
Forrest Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.
Penobscot Bldg., Detroit, Mich.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

FACING CONCRETE WORK

Middlebury Terrazzo for the facing of all Concrete Products and Stucco Buildings gives the appearance of solid marble with a material saving in price.

This aggregate is made from Middlebury White and Creme Statuary Marbles, making a beautiful and everlasting face, giving the building a distinctive appearance, a richness of finish that can be obtained by no other facing.

This material is furnished, carefully graded to size, in either dust, No. 1, 2 or 3. Write for samples and prices

Middlebury Marble Company
BRANDON, VERMONT

METRO NITE
for Stucco

Metro-Nite White is a siliceous dolomite, extremely hard, sharp, cleanly graded and makes a bright, sparkling face for stucco buildings, concrete bricks or blocks.

It is generally accepted as the most beautiful and artistic facing known for this purpose, and we will gladly send samples to anyone who is interested in carload lots.

Metro-Nite can be delivered either in white or green.

THE METRO-NITE CO.
333 Hartford Ave., Milwaukee, Wis.

EVER-GREEN and EVER-RED Slate Granules

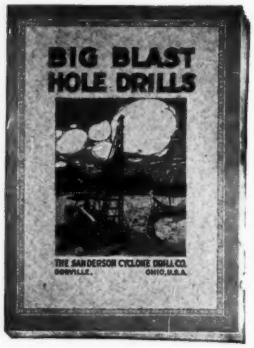
Ever-Green and Ever-Red Slate Granules, used in making slate surfaced roofing, slate flour as a filler in paints, mechanical rubber goods, linoleum, window shades, plastic roofing, roofing cement, and asphalt roads, can be used with telling effect

For the Facing of Concrete Blocks, Bricks or Stucco

The beauty, style and finish of a building covered with this material adds appreciably to its value.

It can be delivered carefully graded to size.

Write for samples and prices
VERMONT MILLING PRODUCTS CORP.
POULTNEY, VERMONT



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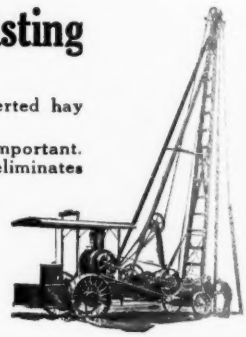

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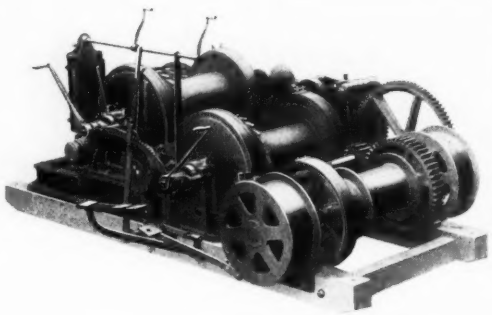

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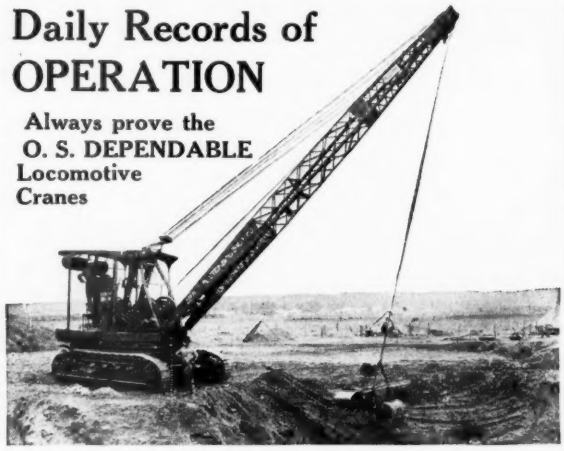

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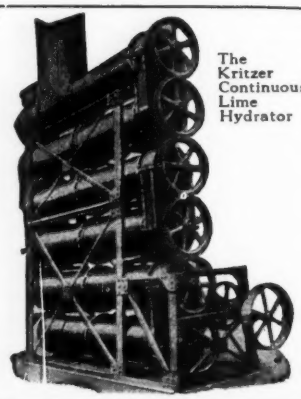

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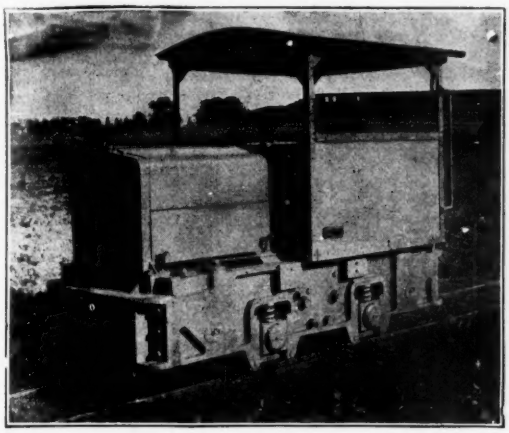

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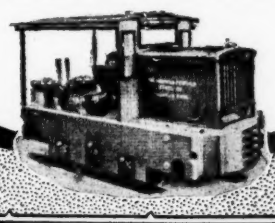

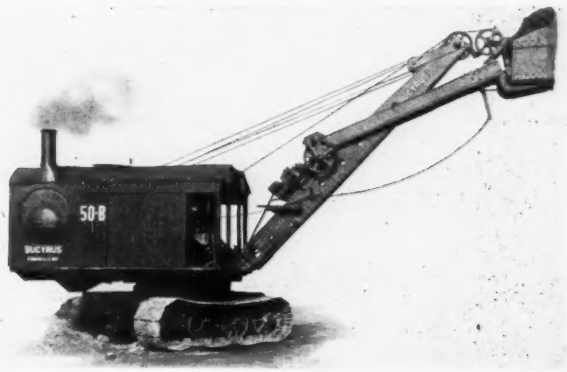

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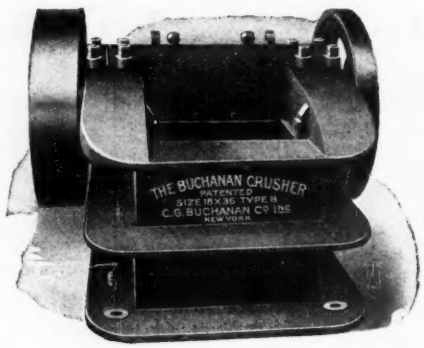

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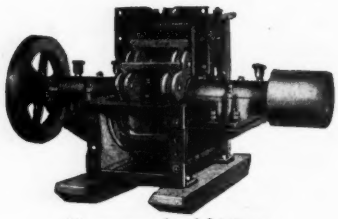

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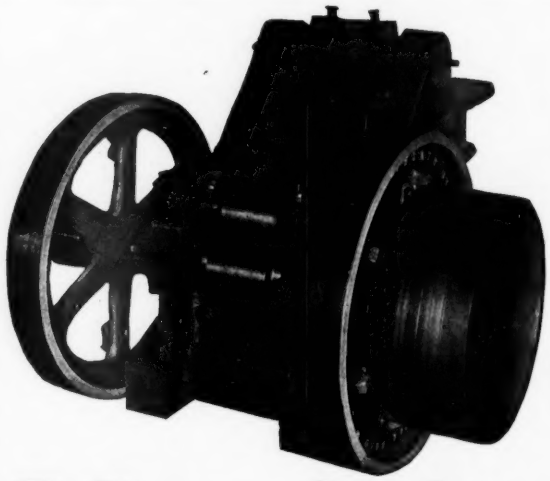

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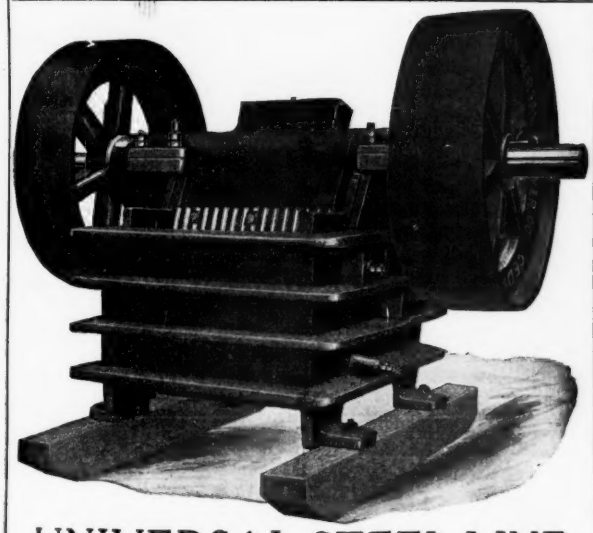

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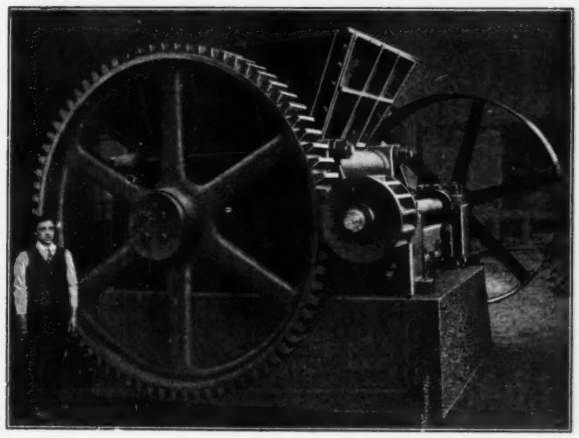

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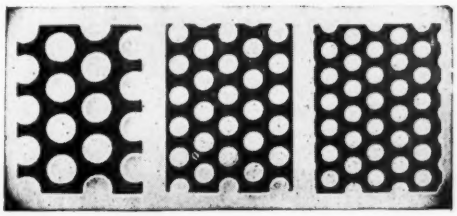

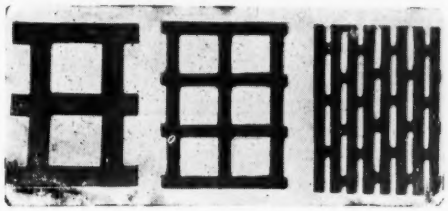

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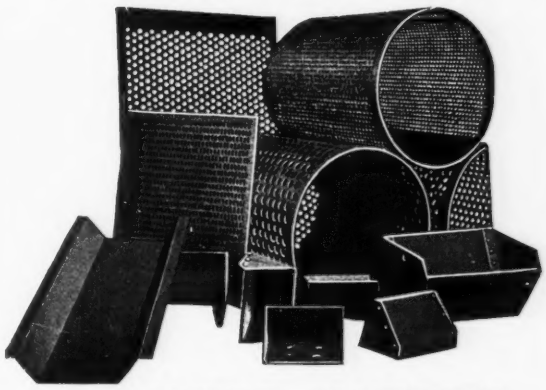

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Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., The, Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

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Bucyrus Co., South Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
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Cleveland Wire Cloth Co., Cleveland, Ohio.
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WE DESIGN AND EQUIP COMPLETE PLANTS

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

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Enterprise, Kansas
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This organization designs and builds Lime and Hydrated Lime, Cement and Plaster plants after we have made a scientific study of each proposition.

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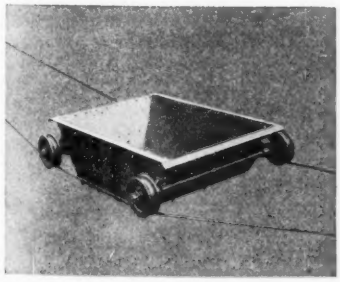

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The Costs of Installation Maintenance and Operation Justify its use at mine or quarry

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THESE machines are absolutely accurate in every detail, weighing and regulating the flow of materials traveling in a continuous stream over a conveyor.

They can be used to unite different materials in the correct proportion, feed materials to mixing machines, deliver predetermined quantity of materials to pulverizing or grinding machines, feed powdered coal in the correct number of pounds per minute, load materials into cars or vessels, giving a record of the quantity loaded, or assemble materials in batches with correct amount of each material.

SCHAFFER ENGINEERING & EQUIPMENT CO.
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Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

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Drive Your Crane to Work!

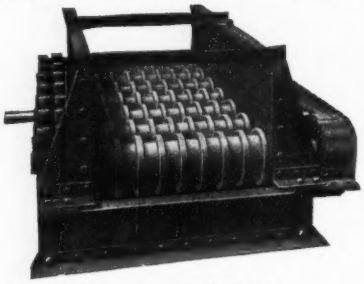
The Byers "Truckrane" can be driven to work just like any automobile. Saves time and expense on every job. One owner recently refused $50.00 rental per day for a two weeks job in Chicago. Ask for "Truckrane" Bulletin.

THE BYERS MACHINE COMPANY
310 Sycamore Street, Ravenna, Ohio
Builders of Full Circle Cranes, "Auto-Cranes," Buckets, Hoists, etc.

You Can't Hold Water in a Sieve

Neither can fines pass over a

ROBINS CATARACT GRIZZLY



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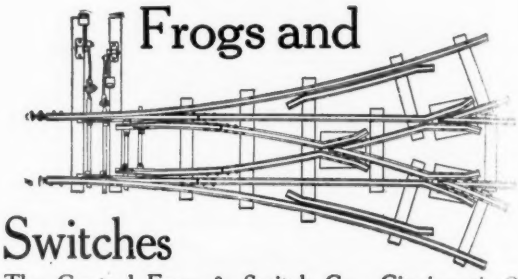
ROBINS CONVEYING BELT COMPANY

New York Chicago Pittsburgh Boston

Frogs and Switches



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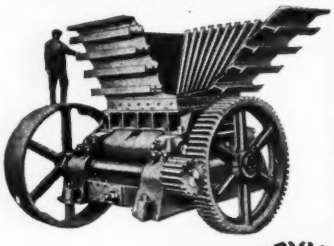
Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fish Plates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

"PENNSYLVANIA" Single Roll Crusher



The New Series of "Pennsylvania" Single Roll Crushers take steam-shovel feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment. Capacities 5 to 450 tons hourly.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Bldg., Philadelphia

New York Pittsburgh

CARS

WE MAKE CARS FOR COAL, ORE, STONE, SAND, GRAVEL, CLAY AND BRICK. DRYER AND INDUSTRIAL CARS. THE WATT FACTORY IS THE LARGEST IN THE WORLD DEVOTED ALONE TO CAR BUILDING OVER 50 YEARS' EXPERIENCE

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The Watt Mining Car Wheel Co.

BARNESVILLE, OHIO

BACON-FARREL ORE & ROCK CRUSHING-WORLD KNOWN ROLLS-CRUSHERS

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CABLEWAYS

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A Flory Hoist for Every Purpose

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ESTABLISHED 1869

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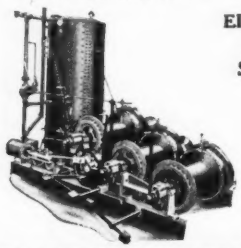

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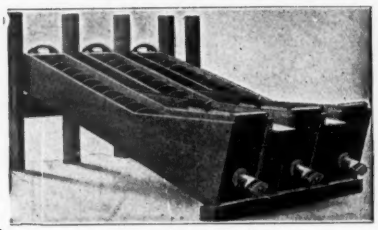

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9-Foot Dry Pan

Lewistown Foundry & Machine Co.

LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

Write for prices and catalog

MORSE SILENT CHAIN DRIVES

Morse Chain Drives

A POWER SAVER FOR POWER USERS

Morse Chain Co., Ithaca, N. Y.

HIGH SPEED SILENT RUNNING FLEXIBLE GEARING FOR POWER TRANSMISSION

Address Nearest Office

Atlanta, Baltimore, Boston, Chicago, Charlotte, N. C., Cleveland, Detroit, San Francisco, Philadelphia, Kansas City, Minneapolis, Montreal, New York, St. Louis, Pittsburgh

CARROLL CHAINS

Are good chains because they are made good. A. C. O'Loughlin Co., operating a quarry near Chicago, said:

"Carroll chain has been satisfactory to date, after six months use."

User satisfaction is always assured with this "Solid Weld Locomotive Chain"

THE CARROLL CHAIN COMPANY
Columbus, Ohio

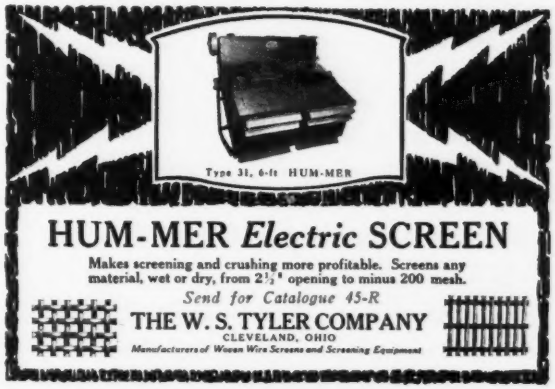
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago
Also Mfrs. of Power Scrapers



HUM-MER *Electric* SCREEN

Makes screening and crushing more profitable. Screens any material, wet or dry, from 2½" opening to minus 200 mesh.

Send for Catalogue 45-R

THE W. S. TYLER COMPANY
CLEVELAND, OHIO
Manufacturers of Woven Wire Screens and Screening Equipment

Chicago Office, Railway Exchange Building

THE McMYLER

THERE is power built into each machine, a ruggedness that can be depended on to stretch out into months and years of flawless service.

Try out the Type "J" Locomotive Crane and its operation will convince

THE McMYLER INTERSTATE CO.
Cleveland, Ohio

BRANCH OFFICES:

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Chicago, Ill., 812 Edison Bldg.
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San Francisco, Calif., 766 Folsom Street
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Electric Motors and Generators

for all requirements of the Rock Products Industry

BURKE ELECTRIC CO.
Main Office and Works
Erie, Penna.

Service Sales Offices

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Sales Agencies

Underwood Electric Co., Cincinnati
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THE STANDARD OF EXCELLENCE

BALDWIN

Industrial and Contractors' LOCOMOTIVES

are in use where dependable motive power is required.

Full information upon request

The Baldwin Locomotive Works
PHILADELPHIA

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

Telephone Court 4508-4509

H. R. EICHER

608-609 Maloney Bldg. Pittsburgh, Penna.

We have purchased from the Consolidation Coal Co. and the Cumberland & Pennsylvania R. R. Co. all of their Surplus Equipment. In this lot we have listed below some of the items and equipment that might be of interest to you at a very low figure. This material is all in A-1 condition, mechanically and otherwise, and will be loaded f. o. b. Frostburg, Md., and can be inspected at that point. Detailed specification on any item obtainable at our Pittsburgh office.

1—Norwalk 3-stage Air Compressor, straight line with intercoolers; steam pressure 125 lb.; air pressure 900 lb.; capacity 750 cu. ft. at 85 R.P.M. $2000.00

1—Ingersoll Duplex Cooper-Corliss, steam pressure 125 lb.; air pressure 900 lb.; capacity 1409 cu. ft. free air at 80 R.P.M. $2000.00

2—Ingersoll-Rand Imperial Type 10, capacity 1319 cu. ft. per minute; piston displacement at 150 R.P.M.; complete with 1-KY General Electric 200 H.P. Motor 3-phase, 60 cycle, 220 volts; 600 R.P.M. with C. R. 1034-H3 Compensator base and pulley 24x32x5; also complete with Air Receivers, Gauges, Fittings, etc. $3500.00 each

1—Ingersoll-Rand Class J-2 single acting 2-stage 24¼x14¼x18 in.; capacity 1000 cu. ft.; maximum pressure 100 lb. at 135 R.P.M.; complete with 1-200 H.P. Westinghouse Motor 3-phase, 60-cycle, 220 volts with slide rails, pulley and starting device; also 1-55 ft. 21-in. 2-ply Endless Leather Belt; complete with Air Receivers, Gauges, Fittings, etc. $3500.00

3—Air Receivers, 30-in. dia. x 20 ft. long, tested 1000 lb. pressure. $75.00 each

1—Air Receiver, 60 in. dia. x 12 ft. long, tested 150 lb. pressure. $50.00

1—150 H.P. Butt strapped triple riveted H. R. T. Boiler, complete with stacks, fronts, fittings, buck-stays, etc. $600.00

2—Westinghouse Standard Steam Engines, 7½x7 in., 350 R.P.M., 20 H.P. $75.00 each

1—Case Steam Engine, 8 H.P., pulley 18 in. x 6½ face, flywheels 18x5½, 648 R.P.M. $20.00

1—110 K.W. Allis-Chalmers A.C. Generators, 2200 volts, 225 R.P.M. direct connected to Harrisburg steam engine 16x14, 150 H.P., 225 R.P.M. $2000.00

2—150 K.W. Westinghouse D.C. Generators, 250-275 volts, 550 R.P.M. $1250.00 each

1—160 H.P. Buckeye Generator Engine, 18x18¾, pulley 90 in. x 26 in., 200 R.P.M. $600.00

1—Westinghouse stand. engine, 7½x7 in., 350 R.P.M., 125 lb. pressure direct connected to 15 K.W. Wood Generator, type MPL Compound wound, 350 R.P.M. 125 volts, complete with switchboard, instruments, main line switches, fuses, etc. $50.00

1—7x10 Single Drum double cylinder Mine Hoist; drum dia. 40 in., face 40 in. $400.00

1—H. K. Porter Air Locomotive, 6 wheel, 16 ton, 36 in. gauge. $600.00

1—Baldwin Air Locomotive, 6 wheel, 16 ton, 36 in. gauge. $600.00

1—H. K. Porter Air Locomotive, 6 wheel, 15 ton, 36 in. gauge. $600.00

1—Baldwin Compound Locomotive, 10 ton, 36 in. gauge. $450.00

4—Baldwin Gathering Locomotives, 4 ton, 36 in. gauge. $450.00 each

1—Storage Oil Tank, 8 ft. diameter, 30 ft. long. $200.00

FOR SALE

Located at Nashville, Tenn.

1 4'x16' Tube Mill.
2 6'x60' Rotary Dryers.
1 6'x6'x12' Steel Hopper, Double Spout.
1 5'x5' Single Drum Hoist.
2 No. 3 Williams Mills.
2 15'x35' Steel Storage Tanks.
1 9'x15' Round Steel Hopper with legs.
9 1¾ yard, 36" gauge, Koppel All Steel Cars.
3 15 H.P. General Electric Motors.
1 40 H.P. General Electric Motor.
1 Sturtevant No. 2 Duplex Ring Roll Mill.
Steel Trusses and Columns.
10 Acre Manufacturing Site with R. R. Siding in property.

Engineering Sales Company **Nashville, Tenn.**

WANTED

35-ton, Four Wheel Saddle Tank Type, Standard Gauge, Locomotive, either new or second-hand, but must be in absolutely first class condition if second-hand.

Dittlinger Lime Company
New Braunfels Texas

WANTED

6'x16" or 6'x22" Hardinge Conical Mill, with scoop feed. Stone-lined with charge of pebbles Want used mill but must be in good condition

Address Box 1598, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Wanted to Buy

No. 4½ Champion or 2½ Climax jaw crusher.

SHANK & ETZLER
Frederick, Maryland

George Borrowman, Ph.D.

CHEMIST

Analyses, consultations, researches in connection with rock products, cements, clays, lime, plasters, zeolites, sands, etc.

9 So. Clinton St. Chicago, Ill.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

DEPENDABLE SERVICE

Hyman-Michaels Co.

531 Peoples Gas Bldg., Chicago, Ill.

RELAYING RAILS AND ANGLE BARS

In All Weights, 30 to 100 Lb. to the Yd.

Quick Shipment
Dependable Service

Get Our Quotations Today

We Also Cut Rails to Lengths for Props, Etc.

OFFICES AT
New York City, 1324 Woolworth Bldg.
Pittsburgh, Pa., 1312 1st Nat'l Bank Bldg.
St. Louis, Mo., 2115 Railway Ex. Bldg.

1—50-ton standard gauge Brooks 6-wheel switcher.
1—39-ton standard gauge Baldwin 6-wheel switcher with separate tender.
1—42-ton standard gauge Shay geared locomotive.
1—12x18″ standard gauge 4-wheel saddle tank.
1—9-ton 36″ gauge 4-wheel saddle tank.
1—23-ton new 36″ gauge Porter 6-wheeler with tender.
10—5-ton 36″ gauge storage battery locomotives.
1—14-B Bucyrus steam shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

FOR SALE

2—8x110′ Rotary Kilns.
5—5x6x7x110′ Rotary Kilns.
5—5x21′ Tube Mills (1 has Silax lining, 3 steel lining, 1 without lining).
1—4′ 6″x40′ Coal Dryer.
2—No. 6 Gates Crushers.
3—5½x22′ Tube Mills.
2—6x50′ Rotary Dryers.
3—Kominuters.
6—Krupp Ball Mills.
3—33″ Fuller Mills.
2—6x60′ Rotary Dryers.

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

IMMEDIATE DELIVERY

Send Us Your Steam Shovel Inquiries

66x86-in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
25-50-80-110-HP. Elec. Hoists.
No. 4-5-6-7½-9 & 10 CRUSHERS.
6 and 12 ton gasoline locomotives.
NEW—1469 ft. SULLIVAN COMP. 2 stage, type WN4, ½ coupling, $1900.00.
2-DISC CRUSHERS, 36 & 24 in. SYMONS.
100-ton, 2½-yd. ELECTRIC SHOVEL.
Columbus Portable Conveyor, 25-ft. Eng. drive.
50-5000 ft. steam, belt & electric drive comp.
JAW AND ROLL CRUSHERS.
10-15 and 20-ton locomotive cranes.
13x30-in., 10x18-in., 9x14-in. JAW CRUSHERS.
1000 GPM. UNDERWRITERS STEAM PUMP—prac. new.
24x54 McLANAHAN ROLL CRUSHER.

Send us your inquiries for Steam Engines, Cent. Pumps, Quarry and Contrs. Equip., etc.

ROSS POWER EQUIPMENT CO.
Indianapolis, Ind.

FOR SALE

Unused Emerson Brantingham Double Cylinder Single Drum **Hoists** in first-class condition, f.o.b. Chicago, **$100** each. Immediate shipment. Full specifications furnished on application.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago

FOR RENT AND SALE

14—4-yd. 36-in. ga. heavy duty Western dump cars.
20—12-yd. Western air dump cars, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader, used sixty days.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, built 1920.
1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, built 1921.
2—Foote 40-S 1-yd. side discharge concrete mixers, with steam engine and boiler.
32—NEW 20-in. I beams, 80 lbs. per foot, 40 feet long, not drilled.
1—NEW Lakewood concrete chuting system.

LOCOMOTIVES

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24 in. four-wheel switcher.
2—NEW 24-ton six wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Illinois

FOR SALE
Centrifugal Pump

Manufactured by the Allis-Chalmers Mfg. Company

1—3 inch three stage horizontal split casing centrifugal pump with base plate and coupling direct connected to 1 50 HP., 1750 REV., 3 phase, 60 cycle, 2200 volt squirrel cage motor complete with potential starter having overload relay and undervoltage release. Practically new and in first class condition.

Marquette Stone Products Co.
McGregor, Iowa

Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK
Frick Building Pittsburgh, Pa.

For Sale—STEAM SHOVEL

⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

ROCK CRUSHER

1—24″x48″ Buchanan Jaw, Mang. Fitted, with quantity new spare parts. Bargain for immediate sale. Also several smaller sizes.

T. H. LETSON COMPANY
46 Church Street New York

Classified Advertising

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

WANTED

Position as superintendent of lime plant. Now employed in that capacity but desire change. Guarantee efficiency and economy. Familiar with most all make kilns, fuel and hydration, also quarry. Can handle your plant from quarry to finished product on car. Would consider a foremanship of any department where ability will promote. Prefer to locate in either Pennsylvania or Ohio. Address

Box 1604, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Position Wanted

Have had 20 years' experience in the production of sand and gravel and wish to communicate with a responsible gravel firm regarding position as superintendent. Am at present employed by a large plant near Chicago. Will be available as soon as plant closes for winter.

Address Box 1605, care Rock Products
542 S. Dearborn St. Chicago, Ill.

WANTED

To lease or purchase—going lime plant with hydrating equipment in Eastern or Southeastern States. Reply with some details, plant and quarry equipment. Preference given, White Magnesium Lime. Address

Box 1602, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR SALE
All or Interest in

300 acres hard limestone land, with 1500x 30 ft. open quarry face. Large new, crushing and screening, plant of 3000 tons daily capacity; centrally located to large demand for material; orders amounting to $200,000 on our books.

Capable man with $25,000 up, and knowledge of business can make big money, if act promptly.

Location in Southwest.

Box 1603, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Experienced manager to superintend Marl-Lime and Fertilizer Plant, and assist in sales work. Should be in position to make investment of $5000 to $10,000. Apply, stating experience

Box 838, Richmond, Va.

H. E. WIEDEMANN
(Est. 1905)
Consulting and Analytical Chemist
Specialist in Analysis of Rock Products
Chemical Bldg. St. Louis

FOR SALE

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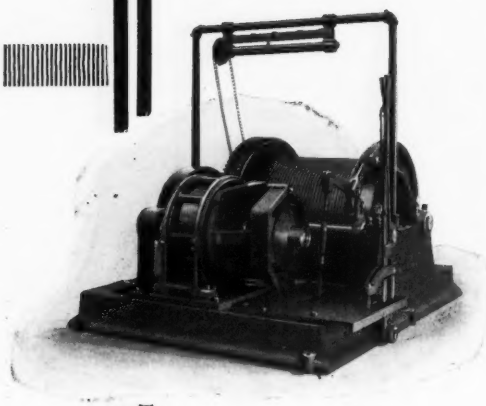

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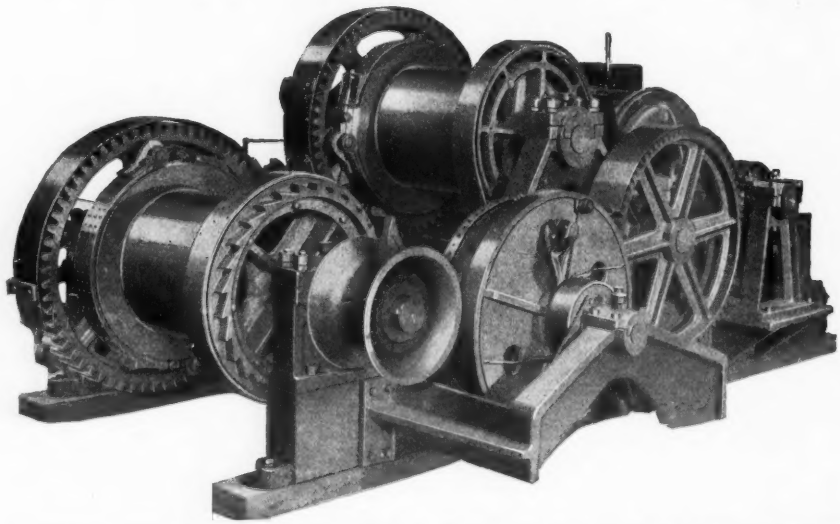

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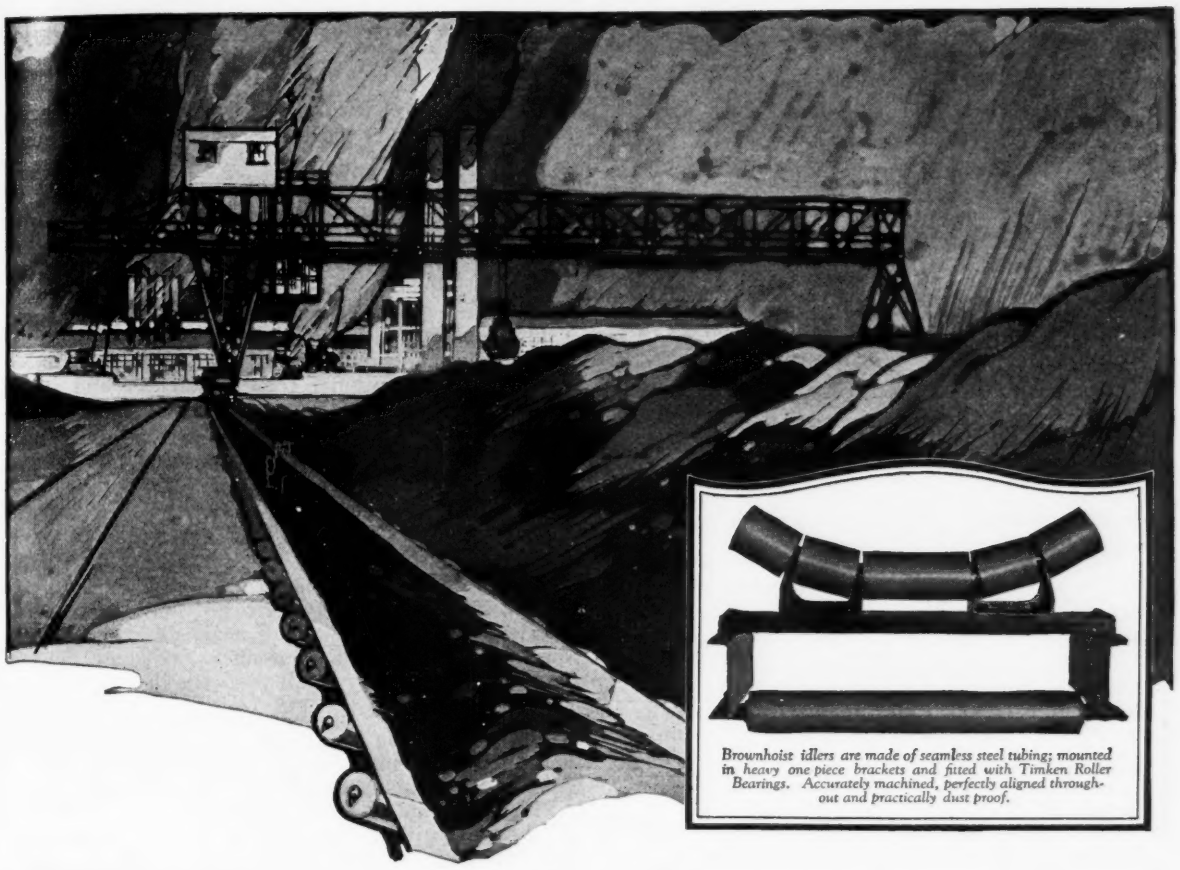

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